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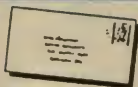
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electron user NEWS

Electron users are power-hungry

ELECTRON users are seeking much more power for their machines in ever-increasing numbers. A new survey has revealed that some 40 per cent have upgraded their machines over the last year.

Of these the majority have opted for compatibility with the BBC Micro, so opening up a vast new potential library of software.

In most cases, the Electron buffs have spent more on the power boosting add-ons than they have on the micros themselves.

With firms like Slogger and Advanced Computer Pro-

ducts offering a variety of machine-extending routes such as sophisticated disc drives, interfaces, expansion roms and ram boards, the future of the Electron now seems assured.

"If companies like this hadn't shown their concern, the Electron may well have become completely extinct by now", observed Derek Meakin, managing editor of *Electron User*.

"But the Electron has always been an excellent machine. It's just that thanks to the ingenuity of some of the firms in the market, it is

now that much better".

The run up to Christmas demonstrated clearly that people are not prepared to shelve their Electrons.

PRES, the company marketing the £99 Advanced Plus 3 disc upgrade for the machine, reported sales of 1,000 units a month.

"We just couldn't keep up with the demand", said a company spokesman. "We found ourselves working into the small hours trying to get them out."

"It seems to have really taken off as an ideal Christmas present".

Support is still strong

A POLL of companies in the BBC Micro market has shown that some 55 per cent have given active consideration to producing products for the Electron.

In all cases those interviewed admitted they had been surprised by the interest that still surrounds the Electron.

"You cannot ignore the continuing popularity of this machine", said John Huddleston of Advanced Computer Products whose firm is now synonymous with the Electron scene.

"It's a very nice little market" he said.

A record again

ELECTRON supplier Superior Software doubled its previous record sales figures last year. And the company also doubled its yearly turnover for the third year in succession.

"We're going to try and do it again this coming year", said Superior's general manager, Steve Botterill.

"About 40 per cent of our sales were due to the tremendous support of the Electron market. We are committed to continuing to supply quality software for the machine as long as there is a demand".

Four new games scheduled should have the same impact on the market as Elite, says the company.

ADVENTURE IS THE NAME OF THE GAME

DRAGON-slating wizards, maidens in distress and the Spirit of Adventure group will travel through time to transform the next Electron & BBC Micro User Show into a fascinating world of adventuring.

Goblins, demons, and all manner of mythical creatures have been taken out of the micro chip games world and brought to life.

The Spirit of Adventure group, which regularly meets to act out medieval quests, will be at the Renold Building, UMIST, Manchester, from March 18 to 20 disguised as minotaurs, zombies, wizards and goblins.

Visitors will get a chance

to play the hero or heroine, battling against magical forces and monsters, under the guidance of some of Britain's top role-playing specialists.

The very latest in hardware and software will also be on display and, in keeping with the adventure theme, a treasure hunt is being held with prizes of the most popular fantasy games for the Electron.

An advice centre manned by experts will be

available to help find solutions to some of the more complicated problems.

The Spirit of Adventure Group regularly meets at unusual locations to create a realistic illusion of fantasy.

They have ranged from medieval banqueting halls to overgrown woodlands. Even an old steel mill has been transformed for their journey back in time.

According to Steve Gibson, one of the group's founders, the Renold Building at UMIST "will prove a bit of a challenge, but with a little imagination and a lot of stamina visitors will enjoy the adventure of a lifetime".

Electrons move to the IT centre

STUDENTS learning information technology at Deyes High School in Merseyside have found the Electron a walkover.

In fact over 500 pupils completed a sponsored walk to raise the cash to buy 16 new machines and monitors.

The Electrons have now taken their place alongside a large collection of BBC Micros at the school's Information Technology centre.

To increase their flexibility the machines have been equipped with an ACP Plus 1 and an AP4 disc interface as standard.

"I have known for some time that the Electron was a great machine", said Russ Ellis, lecturer in Information Technology at Deyes High School.

"Having previously only used BBC Micros, some of the teachers were a bit apprehensive. But now they all agree that the Electron is an excellent computer to work with".

The machine has proved so popular that a number of children have bought their own in order to continue studies after school.

A large part of the IT course involves studies for the Cambridge information technology cer-

tificate. A thorough understanding of word processors, spreadsheets and databases is needed to qualify for the award.

All students also undertake a compulsory one-year course in computing. "The Electron is playing a vital part in equipping our pupils with the skills that they will need for a secure future", said Russ Ellis.

Red ruse

THE first computer game from Russia has infiltrated the UK via Hungary with help from Mirrorsoft agents.

Tetris is said to be easy to play, incredibly addictive – and almost impossible to explain.

Random shaped blocks appear in a box on the left of the screen, and you have to move and turn them to form a continuous line across the bottom of the screen in order to score points.

It may sound simple but if you are not fast enough the blocks on the left build up until they touch the top of the screen. When that happens the game ends.

Price £8.99 on cassette and £12.99 on disc from Mirrorsoft (01-377 4645).

Rhyming lessons

A CHILD-minding service has taken on six Electrons as members of staff.

The machines are being used to help look after youngsters under five years of age who attend centres run by the Birmingham Kiddy Care co-operative.

Marjorie Dixon, the director, bought the machines after she saw the *Electron User* Nursery Rhymes package.

"This was perfect for what we wanted," she said. "For it would not only keep the children happy but they would also learn at the same time."

"And the mothers who

leave their children here when they go off to work are delighted with it all".

The Nursery Rhymes software offers old favourites such as Humpty Dumpty and Jack and Jill as part of a learning environment.

"Since the computer arrived, my four-year-old's spelling has come on in leaps and bounds", reported one happy mum.

"I've always hated computers before – only thinking of them as things that screwed up monthly bills – but this has made me view them in a completely different light"

THE
GALLUP
CHART

TOP 10
ELECTRON SOFTWARE

THIS MONTH	LAST MONTH	TITLE (Software House)	PRICE
1	2	AROUND THE WORLD IN 40 SCREENS <i>Superior</i>	6.95
2	3	PAPERBOY <i>Elite</i>	9.95
3	1	SOCCER BOSS <i>Alternative</i>	1.99
4	•	LIFE OF REPTON <i>Superior</i>	6.95
5	5	SUPERIOR COLLECTION VOL 2 <i>Superior</i>	9.95
6	4	FOUR GREAT GAMES <i>Micro Value</i>	3.99
7	7	TRIPLE DECKER <i>Alternative</i>	1.99
8	6	CODENAME DROID <i>Superior</i>	9.95
9	•	SPELLBINDER <i>Superior</i>	9.95
10	•	MICROBALL <i>Alternative</i>	1.99

Compiled by Gallup/Microscope

There are three new entries in this month's chart – two new releases from Superior and another new one from Alternative. This means that two Repton games are in the Top Five – Around the World in 40 Screens and the new Life of Repton.

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By Pendragon

THIS month sees the release of some old adventures in new packaging and at bargain prices.

The US Gold collection of nine games on one disc or tape is an offer not to be missed. The adventures include Voodoo Castle, Pirate Adventure, Strange Odyssey, Temple of Terror and Buckaroo Banzai.

The package is made good with four old Ultimate arcade-adventures. Retailing at about £18 for the complete collection this

must be worth considering.

Meanwhile, Adventure Soft's Scoops, with four adventures packaged on one tape for only £7.95, is also an essential buy.

Those of you who have a Slogger Master Ram board and SEDS or an ACP Plus 4 fitted to your Electron may be interested to learn that Topologika has re-released revamped 5.25in disc versions of the Acornsoft greats, *Philosopher's Quest* and *Countdown to Doom*.

These classics have been given extra locations and atmosphere to make them worth looking at, even at £17 each.

In the final stages of preparation is Geoff Larsen's sixth adventure, *Hex*, which should be on general release very soon.

At Robico, Glen MacCauley is editing *Communism*, which is part two of *The Village of Lost Souls* trilogy, and promises to be an absolute blockbuster.

The new Elk Adventure Club release, *The Axe of*

Old wine in new bottles

Holt, is also due out this month. If it follows the tradition laid down by *Magnetic Moon* and *Starship Quest*, it will be an essential buy.

However, all is very quiet at Shards. I know many of us have been waiting for almost two years for the release of a sequel to *Woodbury End*. So how about writing to Steve Maltz letting him know that such a sequel would be greeted with shouts of glee from all corners of the Electron

our machine has never been higher, and this is borne out by the phenomenal array of top notch adventure games in the most recent top twenty.

Remember that these charts are compiled purely from your votes for your favourite adventure games.

It's good to see the two new Robico releases feature so prominently in the chart. I have received a lot of mail praising the quality of these two masterpieces, and

READERS' TOP TWENTY VOTES

1	The Hunt	Robico	93%
2	Village of Lost Souls	(Robico)	92%
3	The Lost Crystal	Epic	90%
4	Oxbridge	Tynesoft	86%
5	Dodgy Geezers	Melbourne House	84%
6	Myorem	Robico	83%
7	Kayleth	Adventure Soft UK	82%
8	Rick Hanson	Robico	81%
9	Wheel of Fortune	Epic	80%
10	The Ket Trilogy	Incentive	78%
11	Twin Kingdom Valley	Bug Byte	77%
12	The Puppet Man	Larsoft	76%
13	Woodbury End	Shards	74%
14	The Nine Dancers	Larsoft	71%
15	Philosopher's Quest	Acornsoft	70%
16	Quest for the Holy Grail	Epic	68%
17	Suds	Riverdale	68%
18	Terrormolinos	Melbourne House	67%
19	Magnetic Moon	Elk Adventure Club	66%
20	Project Thesis	Robico	63%

Adventurer's Glossary

(continued from last month)

Dagger: A handy weapon, but usually with some limitations of use.

Dark: Always at some point in an adventure, so you will need a light source.

Desert: Features in many adventures, and often a maze. Be sure to have a plentiful supply of something to drink before you venture on.

Desk: Always worth examining, and try opening the odd drawer.

Diamond: Invariably a treasure.

Ditch: Often a trap, so beware. It may need crossing so look for a bridging point.

Doll: Unlikely to be ordinary, probably a voodoo doll.

Dragon: Kill it, but examine its corpse once it is dead.

Drink: Essential to survival. Water is usually safe, but avoid Ale and other potent or enticing liquors.

Dwarf: Almost always hostile; best to kill and ask questions afterwards.

software-buying public.

R. Forster of Hale is the first person to contact me to say he has discovered the word Pendragon at a hidden location in *Suds*.

I have forwarded his name and address to Riverdale Soft and he can expect to receive a complimentary copy of *American Suds* upon release.

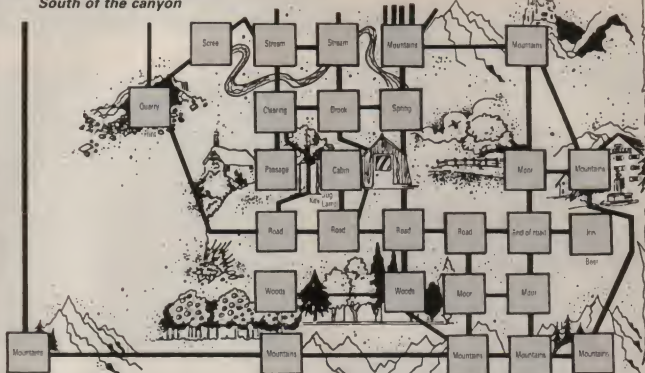
I mentioned last month that 1987 was an exceptional year for adventure releases for the Electron. The quality of software for

surely they are now the yardstick by which all other adventures must be judged.

It is also pleasing that small companies such as Larsoft and Riverdale are producing adventures which readers so obviously enjoy. This can only be healthy for the market in general and Electron users in particular.

With a flood of new releases due in the coming months, the next chart should present quite a different picture.

Twin Kingdom Valley map 1: South of the canyon



Readers' Hall of Fame

The Puppet Man – Geoff Livesey (continued from last month)

Go East and talk to the muse, then S, S, W, enter the willow and talk to Pierrot. E, E, S, W, S, get the candle, N, E, E and enter manor. UP, N, get the glove, examine the shelf and read the note.

S, DOWN, LEAVE, go onto the stage and talk to the juggler. He will be distracted and drop one of his clubs. get it, jump down, W, S, S, W, S. A man will rush off to the west.

Now you can go W, W, W. Drop the club, setting off the trip wire. S, S, W, S, E, into the clown's house. Examine the fireplace, wear the glove and get the poker.

W, N, W, into the tavern. Examine the fire and poke the cinders. Still wearing the glove, get the black key. It will soon cool and you will no longer need to wear the glove.

E, S, E, and light the candle from the clown's fire. W, N, N, UP, enter the door, unlock Pierrot's desk and get his poem. ENTER DOORWAY, DOWN, S, E, N, N, E, E, E, N, N, N, E, and go onto the stage again. Give the poem to Columbine.

Now jump down, W, N, N, N. Erato will advise you to examine the stump. Get the marionette, S, S, S, E, into the Inn. Give the marionette to the Puppet-Man.

Kayleth – Robert Henderson (continued from last month)

Go to the shelf where you found the suit and get the bar and cube. Go and get the lenses and the pyramid which is on floor three.

Leave the building and continue until you are in the forest by the Mokki Ray, then spin the bar. Climb the tree, wear the lenses and flip the knot. Take the tablet and examine it, this will give you the AZAP CODE AKN. Go to the AZAP chamber and type AZAP CODE AKN.

Break the tablet which should leave you a rod. Go to

the Citadel and you will be surrounded by Zemps. Spin the rod to scare the Zemps. Once you enter the building, type GO SOCLE and a voice will reply, "To be with me, drop the silver three". Now drop the pyramid, cube and rod, and the Socle will descend.

Take the mortar and pod and GO SOCLE. Get the dime and go back to the AZAP chamber and type AZAP CODE ELY. Now you must go back to the city, pay Broznak with the dime and get the bottle of water.

Examine the furniture to find Yurek and give him the rod, then take him to the steel dome. Return to the AZAP chamber and type AZAP CODE EPO. Insert your plasma beam cartridge and fire the beam at the wall. Go back once again to the chamber and type AZAP CODE ELY.

Travel to floor 3 and INSERT YUREK INTO INDENTATION! You will now transform into Yurek. Get the ball and mortar and return to the AZAP chamber. Type AZAP CODE EPO, leave the chamber and go South.

Insert the ball into the icon and when you see the Atech technician, give him the mortar. He will give you a bulb. In the chamber, type AZAP CODE ELY. Get the water, plant the bulb in the compost and water it.

Wait for a few moves and a flower will grow. Take this and drop it in the mortar. You now have essence of tae which can be used to kill Kayleth.

In the AZAP chamber, type AZAP CODE DHT. You will be transported to the control room of Kayleth's starship. The code to open the door is an anagram of all the AZAP codes: ELY, ROO, AKN, EPO and DHT. You should decode this to OPEN KAYLETH DOOR.

To kill Kayleth and finish the game, drop the tae in the pool.

Enthar Seven – The Boss (continued from last month)

Equip yourself with the space helmet, oxygen cylinder, spherical sweet, pliers, hammer and torch, then set the teleportal to take you to sector three. Once you enter you

Turn to Page 10 ▶

will find yourself in a confusing forest maze with illogical exits.

By careful mapping using the drop technique you will soon be able to chart nine different locations. One of these is a clearing which leads to a teleport booth and another will reveal a flipper plate if you move the leaves.

Stand on the flipper plate to be transported to an elevated walkway in the treetops. You must now attach the cylinder to the helmet and wear it unless you want to suffocate in the rarified atmosphere.

A quick reconnaissance will lead you to discover three chasms which appear at first to be uncrossable. However, the crevice at the end of the east bound catwalk can be traversed by swinging on the creeper.

On the other side you will find a plank of soft wood which can be used to bridge a gap on three separate occasions before it breaks. However, the drop at the edge of the west bound walkway can be safely jumped without resorting to using a bridge, and a large fan can be retrieved.

The gap to the north of the ramp must be bridged using the plank. At the other side a complicated manoeuvre is involved. If you examine the sweet you will discover it is 15cm in diameter.

The doorway to the tree has an ingenious locking device involving a funnel 9cm in diameter. You need to suck the sweet and examine it regularly until its diameter matches that of the funnel. Now insert the sweet into the funnel and the door will swing open.

You will soon meet a spider with a venomous bite, but don't worry it's only a nightmare.

Problems Solved

Superior Software's graphic adventure **Stranded**, now being offered at a bargain price, is being discovered anew by many other adventurers and consequently causing a number of familiar problems.

Robin Cornelius asks how to get through the air lock inner door. Simply pick the lock, Robin.

Mark Patterson is puzzled by the fuel capsule and time crystal. You must drop the crystal in the slot in the large control room. Similarly, the fuel must also be dropped in a slot.

Mark is also stuck in **Circus Adventure**. He has activated the generator, but doesn't know what to do next. I suggest you syphon some fuel for your car, Mark.

Ewan McPherson is having difficulty escaping from the whale's stomach in

Philosopher's Quest. You need to light a match and travel in the opposite direction to the smoke to find the exit.

Mark Hilton needs to follow the paved path off the old side street in Witherton to discover the cottage garden in **Project Thesius**. While Duggie MacDonald should strike a match to give the serpent heartburn in **Sphinx Adventure**.

I must thank Robert Henderson for a copy of **Eye of Zoltan**. It has enabled me to help Trevor Hicks and others to open a few doors. You need a bunch of keys and a password to establish the rights of way.

Finally I must thank James Mottram for his extensive hint sheets for **Dodgy Geezers** and Elizabeth White for the enormous help she has given so freely.

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Red-hot sequel

Product: Plan B2

Price: £1.95

Supplier: Bug-Byte, Victory House,
Leicester Place, LONDON WC2H 7NB
Tel: 01-439 0666



SEVEN months after *Electron* User awarded Plan B the title of Golden Game, Bug-Byte has released its red-hot sequel called, surprise, surprise, Plan B2. So what novelties are in store for hardened fans of the original game?

Well, at first sight not a lot seems to have changed. To my disappointment there is still no use of colour, but I hadn't really expected Bug-Byte to have been able to do this and keep all the different characters moving around at the same incredible speed.

The plot on the inlay card looked familiar – which wasn't surprising, as it is identical to that of its predecessor. As plots go, it still holds up as a fairly decent scenario.

You are in control of a single war drone. Your job is to explore the Trogian Computer Complex, find and destroy all of the computer's parts, and escape intact.

This objective is complicated by the fierce and persistent security robots which patrol the complex's many rooms. Nasty beasts, these – they can fire two dozen rounds of laser bolts quicker than you can say micro-processor.

Your drone is fully equipped with a rapid-fire laser, but your ammo is limited. Replacement stocks can be found in various locations, usually guarded by more security guards.

You have a shield, too. This will absorb quite a number of enemy laser bolts, and you can even ram the security robots, causing them to disintegrate in a most undignified manner. Be careful, though, as repair kits for your shield are difficult to find.

In your search through the

complex's many rooms careful thought is required to reach your objective. Some walls block your targets, making them appear seemingly unreachable. That is, until you realise that they will disintegrate under fire.

Not all walls are this obliging. Some have hidden weak spots which you must find quickly while the robot guards are doing their level best to vapourise your shields.

There are sliding doors which can't be opened by anything short of a key. The keys are found dotted about, usually in the most awkward places, and come in four different types. It is most frustrating to battle your way up to a strategic door only to find the wrong key is in your sweaty clutches.

Oilcans and spanners sprinkled around the complex will replenish your shields, although more than once I was needlessly obliterated while trying for an unnecessary top-up.

The security robots are the bane of your life. No sooner has a whole batch been satisfactorily polished off – to the accompaniment of some very good sound effects – than an even larger horde materialises, drenching your drone in shield-depleting rocket fire.

This makes your quest to destroy the complex become almost secondary to hunting down the elusive cans of re-vitalising oil and searching out the odd pain-relieving spanner.

Upon being vapourised at the end of a fruitless game, you may object to the message that "You appear to have snuffed it", which is painfully obvious. But it's fun, all the way through.

The controls are identical to the original Plan B, as has been everything described so far. So now to the differences:

Firstly, in the original game your drone could only wander over black backgrounds. In B2 a most amazing scenery-masking technique is employed, allowing you to drift over



pillars, up walls and through certain floors.

Plan B had fairly nice-looking large sprites which were not animated. The sequel features extremely detailed lovingly-crafted beasts, all of which are animated in some fashion. They tend to be smaller though, to allow for more speed.

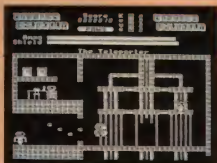
One annoying feature of Plan B was the bullets. These flickered at times. In Plan B2 however, not only is every single object 100 per cent flicker-free, but the whole game is faster than the original.

Although in black and white, Plan B2 exudes quality and craftsmanship, from the high-resolution metallic-looking sprites to the textured background of the computer complex.

Nothing seems to have been wasted here – every ounce of speed has been wrung out of the game, and at the expense of nothing whatsoever. I ran Plan B2 on both a BBC Micro and a Master 128, with neither being any faster at it than my *Electron*.

Generally, all sprite movement has been improved immensely. You can have no real idea of just what this means until you see the game in action. It is probably the best showcase of what your *Electron* can achieve that I have ever seen.

Chris Nixon



Sound	10
Graphics	10
Playability	10
Value	10
Overall	10

Good clean fun

Program: Bonecruncher
Price: £9.95 (cassette), £11.95 (5.25in disc), £14.95 (3.5in disc)
Supplier: Superior Software, Regent House, Skinner Lane, Leeds, LS7 1AX.
Tel: 0532 459453

IN Bonecruncher you play the unlikely part of Bono, a cute little green dragon who lives in a castle by the sea. As an enterprising soul, you have set up Bono's Bathing Company making soap, a commodity prized by the monsters who bathe in the moat.

As everyone knows, real soap is made from bones. So to keep the customers happy you must collect the skeletons littered around the castle and boil them up in your cauldron. This turns them into luxurious skeleton soap.

However, the castle is anything but a safe place. There are trapdoors through which you can disappear without trace. On top of this, some of the skeletons are not yet skeletons – they're live and very deadly monsters, with an insatiable appetite for little green dragons.

A further hazard appears in the shape of giant spiders that rush around the walls biting any hapless dragons in their path. These will also eat any bones they find. You must

race the spiders to collect the skeletons before they do.

The castle is also inhabited by Glocks, large creatures who love the smell of soap. When you have climbed up a stairway to supply another customer with a bar of soap, they will – after a short delay – all move in the direction faced by this stairway. Although a Glock is not in itself harmful, it will crush you if you get in its way.

An added problem is that you may find yourself, or the way forward, blocked by Glocks if you are unfortunate enough to take a bar of soap up the wrong stairway. However, you can push them or take advantage of the direction in which they are trying to move to suffocate monsters and turn them into skeletons.

Fortunately, Bono's Bathing Company is not a one-man show. Your partner Fozzy, is the brawn of the operation, strong enough to hold monsters and spiders at bay. He's not very bright however, and you must keep an eye on him to make sure he is not trapped or wandering in circles.

Bonecruncher is similar in appearance to Superior's classic Repton, with smooth four-directional scrolling and fiendish puzzles. However, the two games are quite different.

The addition of Fozzy and the



Glocks brings an entirely new dimension to the game, not the least of which is that the Glocks' movement causes the layout of each chamber to change repeatedly around you.

The humour in Bonecruncher is probably its most appealing aspect. The skeletons grin at you and tap their feet expectantly, and if you stand still for more than a few seconds Bono will start to yawn and stamp his foot impatiently. The monsters are also beautifully animated, jumping up and down showing a mouthful of teeth.

Bonecruncher will delight game players of all ages – another sure-fire hit.

Mac-Man

Sound	9
Graphics	9
Playability	9
Value for money	9
Overall	9

Another brick in the wall

Product: Trapper
Price: £1.50 (cassette)
Supplier: Blue Ribbon Software, CDS House, Beckett Road, Doncaster DN2 4AD.
Tel: 0302 21134

THE aim of this budget arcade game is to trap monsters by pushing brick walls around to box them in and finally to squash them.

The title screen is typical of Blue Ribbon – simple and quick to load. There isn't a demonstration mode, so the game flicks between a list of control keys and a high score table.

On starting you are asked to input the difficulty level from one to six. This controls the monster's speed. One is slow and six is fast. I found the slowest speed quite fast enough for me.

The screen consists of a pile of bricks enclosed in a large box. Inside the box are you and a monster, which obviously considers you to be a rather tasty tit-bit. Fortunately you are a strong chap and can push the bricks



around quite easily. The monster can't push the bricks, nor can it pass through them.

So by pushing them round and piling them up you can eventually trap it (if you're lucky and can avoid it for long enough). Having done this, you then push a brick into it and squash him flat.

Screen two is pretty much the same as screen one, except that you now have two monsters to contend with – double trouble. The game now starts to get a bit hectic as you try to trap

both. While you're concentrating on one, the other is sneaking up behind you.

Screen three brings three monsters, and four brings four. The final two rooms only have four monsters, but another is born immediately you trap and squash one.

On top of all this, there is also a time limit. A clock in the top-right corner of the screen slowly ticks away. If it reaches zero before you've trapped and squashed all the monsters you die and loose a life.

Although the game has a very simple theme, it is difficult, frustrating and challenging enough to make it highly addictive. The devilish grin on the faces of the monsters is a nice touch and it all adds up to a fun game that doesn't cost the earth. This is recommended.

Roland Waddilove

Sound	5
Graphics	6
Playability	9
Value for money	10
Overall	8

Use the force, Luke!

Product: *Star Wars*
Price: £9.95 (cassette)
Supplier: Domark, 204 Worpole Road,
 London SW20 8PN
Tel: 01-947 5622

SEVERAL years ago Atari released a coin-op arcade game based on that most famous of space adventure films, *Star Wars*. Employing fast moving vector graphics it was an instant success. Domark have now released a version for the Electron.

As in the original game, the action is divided into three scenarios – dogfight in space, through the towers and down the trench. These scenes are repeated with increasing difficulty as you proceed through the game.

Scene one is based on Luke's dogfight in space en route to the Death Star. The Empire's Tie-fighters zoom in at high speed, launch laser bolts, then veer away.

Using the four direction keys you steer the fighter's gunsights over the laser bolt and fire. The same tactics also work with the fighters, but the bolts must be your main priority. Each

hit you sustain destroys one of your shields – you begin the game with six. Lose every shield and the next hit will destroy your fighter.

If you survive the dogfight you are transported to the surface of the Death Star (though not on level one). Here you begin a strafing run through a forest of laser-firing defence towers.

I found this to be the easiest of the three scenes. By swinging your sights slowly left and right while pressing the fire button you can destroy all towers and laser bolts in your path without sustaining a hit.

The final scene is set in the trench. To destroy the Death Star you must travel its full length and accurately blast the exhaust port at the far end. Success is rewarded with an exploding Death Star.

On level one the only hazards in the trench are laser bolts – you can avoid these by flying high and left, only venturing down into the trench at the very end to zap the exhaust port.

Unfortunately these tactics don't work on the higher levels, where the trench is criss-crossed by barriers –



these must be flown over or under.

Unfortunately although *Star Wars* sounds attractive, the graphics are chunky (Mode 5), monochrome and at times, poorly defined. The gameplay is very sluggish and the controls are slow to respond. On top of this you have to sit through a 20k loading screen before the game starts to load.

All this adds up to a pretty dull, unexciting fare. I would advise you to try before you buy.

Neve Astley

Sound	3
Graphics	4
Playability	5
Value for money	5
Overall	5

High flyer

Product: *Spitfire '40*
Price: £9.95 (cassette)
Supplier: Mirrorsoft, Athene House,
 66-73 Shoe Lane, London EC4A 3AB
Tel: 01-377 4645

ALL you lovers of those old World War II films can now train to become top fighter pilots with *Spitfire 40*, a new flight (or should that be fight) simulator from Mirrorsoft. With plenty of practice, skill and just plain good luck, you can rise to the rank of Group Captain and be decorated with the VC, DSO and DFC.

On starting, you are presented with five pilots' names from which you must select one. A log book for the pilot is then shown. This displays his name and rank, the number of flying hours clocked up, the number of victories and any medals awarded. I was disappointed not to be allowed to enter my own name here.

Finally, a menu is printed which shows the three game options. The first is a practice run which enables you to concentrate on learning how to fly the Spitfire without the worry of being shot at by enemy planes.

A successful landing adds the flying hours to your log. Once you've clocked up enough hours and feel

fairly confident of your ability to fly you can try your hand at aerobatics in preparation for combat.

Combat practice places you in a situation where you can try out your technique. In this mode, crashing or being shot down does not count against you on your log.

Once you've had enough of this, you can move on to the real thing – air to air combat. First you are given your mission instructions. These tell you how many enemy planes there are and where they are situated in relation to the runway.

When airborne, you can have a map of the area you are currently flying over displayed on-screen. The enemy planes' positions and their heights are also indicated.

My favourite part of the game is the dogfight. I found it difficult to hit the enemy at first as it takes about a second for the shots to reach their mark.

Overall, the game is fairly easy apart from landing the Spitfire. The dogfights can be quite tense – I the first time you shoot down an enemy aircraft you get a real feeling of achievement.

The instruction manual is clear and tells you all you need to know about the game. Not only that, it also gives



you a brief, but interesting, background history to the Spitfire and includes a small bibliography of books for anyone wishing to learn more about this great aircraft.

The one thing I found lacking was that almost undefinable something which makes a game addictive. I enjoyed playing it for short periods, but it isn't one of those I would automatically reach for when sitting down for a gaming session.

Desmond

Sound	6
Graphics	6
Playability	6
Value for money	6
Overall	6

Winter Warmer

Program: Winter Olympiad 88

Price: £9.95

Supplier: Tynesoft Computer Software,

Unit 3, Addison Industrial Estate,

Blaydon, Tyne & Wear NE21 4TE.

Tel: 091-414 4611

NOT so long ago the market seemed to be swamped with sports games of every description. But all of them had one thing in common – joystick or keyboard bashing to the point of destruction.

My first thought when I saw the cassette inlay for Winter Olympiad 88 was "Not again...!", but the sheer addictiveness of this game soon changed my mind.

The scene is set as soon as you open the box, with a four page introduction to the forthcoming Canadian winter olympics by TV presenter David Vine. It conjures up pictures of crisp, snow-covered and mist-shrouded mountains dotted with pine trees that rustle in the wind.

However, as the manual itself is only six pages long, all instructions, hints and tips for the six different events are squashed on to the last two pages in small, eye-straining print.

That aside, the first part of the game to load is the core, so called because it is the section of program which controls each event.

This takes rather a long time, but eventually a rotating scoreboard appears, which stops turning and asks for the number of participants and their names. A nice touch this, and the revolving scoreboard crops up again later after each event.

The first event – Bob Sled – is quite hard. Using only the Z and X keys to

apply left and right braking, you guide the bob-sled around each bend and curve of the icy channel, trying to squeeze as much speed as possible from the fragile-looking craft.

Banking too hard causes a heart-rending squeal of metal on ice, followed by the sled overturning, with the occupants falling out and ending up trapped underneath. It looks and sounds quite painful.

The scenery is animated quite well for an Electron game, with pine trees rushing – or creeping as some irreverent souls muttered – past to either side of your speeding toboggan.

Speed Skating is the next event and visually this is perhaps the best of all six. You are presented with two views of your player, one from the side and one from in front. These are synchronised quite well, with both heads bobbing together, and both sets of arms and legs swinging in unison.

I have to admit that pretty though it is, I'm not sure what purpose is served by splitting the display in this fashion. Nevertheless it looks good, even when the front view player banks sideways and his legs stop, while the side view player keeps his legs pumping steadily away!

Your controls for this event are the same as before, but this time an element of familiarity creeps in – you have to pump the keys alternately to gain speed and momentum.

There is an element of skill to this, however. Pressing the keys too quickly causes the skates to slip and you lose speed: Slow down and the speed needle starts to climb again.

The only niggle with this event – and with some of the later ones – is your inability to abandon the game if

you are fed up and want to move on to the next one.

Each event has three heats, and if there are four players participating with each heat lasting 1-2 minutes, it can take 15 minutes to move on to the next event.

Moving on to the Ski Jump, event three, you are greeted with a spectacular view of your player poised at the top of the jump. After the three beeps you are again pumping the Z and X keys for all you are worth.

This time, finger speed is vital if you are to gain enough momentum for a good jump.

As the man reaches the end of the slide, the scene switches to a side-on view of your player being catapulted into the air. Now the Z and X keys become alignment controls for the skis.

The skis tend to drift apart in flight, so you must keep them in line until landing. Otherwise not only could you lose points for bad style, but also you might end up unceremoniously sliding face-down in the snow.

I quickly tired of this event, as after a while the game turns into a monotonous frantic key bash, followed by a quick bit of ski-alignment. There isn't really enough skill in this one.

Event number four is the Giant Slalom, in which you rush downhill, guiding your skis between gates made of black and red poles.

This event was a lot more satisfying than the previous one, requiring lightning-fast reflexes to swing your player left and right through the gates.

These must be entered with the red pole to the player's left – your right – and in a panic this can easily be forgotten, resulting in doleful bongs from the computer's speaker as you accu-



The biathlon



The downhill

mulate penalties. At the end of each heat, any penalties add seconds to your score, and I can tell you that as a consequence mine was consistently worse than the other contestants.

The graphics for this event are very good indeed, accompanied by exhilarating whooshing noises as your skis cut swathes of snow at each turn.

The pole detection seemed very accurate, allowing some very tight squeezes to be accepted. But as soon as a pole is touched, it bends at an angle and you hear a warning tone – a highly addictive section of the game.

The Ski Slalom, event five, is next on the tape. This was quite good fun, and my favourite of the six events. Your viewpoint is from just behind and above your player's head as he plunges through the snow.

Gates appear to the left and right of you, leaving barely enough time to react and slam to one side or the other to clear the poles.

You really do need a lot of skill for this one, as the poles leave little margin for error. Sometimes the gates are so far to one side of you they can't be seen and a large blue arrow suddenly appears, suspended in mid air, which points to either left or right.

It's quite a feeling when you actually manage to respond to one of these warnings in time and shoot straight between the poles at an incredibly tight angle.

Again, good graphics. A mountain range scrolls from side to side in the distance as you manoeuvre. The warning arrows are a nice touch, but I challenge anyone to respond to all of them in time.

Moving on to event six you join the Biathlon. This is the final event on the tape, and as such it is quite a good finale for a very entertaining package. It is really two events in one. You first

have to speed-ski up to a row of five targets using the Z and X keys, whereupon the screen expands to show the targets as a rifle-range with five bullseyes to hit.

Your rifle is then cocked – another nice touch achieved by clicking the cassette relay on and then off – and a black cross-hair moves down the target.

Pressing the spacebar fires your gun, and if the cross-hair is exactly over the bull at the time, you are rewarded with a satisfying smacking sound and the bull is coloured black. If

you miss, you hear an off-key ding, and your miss is marked with a red cross.

This exercise is repeated for all five paper targets before you must again shoulder your rifle and speed off into the snow to find the next cluster of targets.

Overall, Winter Olympiad 88 is an entertaining package, marred only by the slight monotony of some events, and the inability to fast-forward to the section of your choice.

The sound effects are by nature limited, but there is a nice jingle at the end of each event which you may recognise from previous televised Winter Olympics.

As an Electron game, it holds up against even the BBC Micro – I ran the programs on both machines, with no noticeable change in speed.

At £9.95 Winter Olympiad 88 has got to be good value, as you are effectively getting six games for your money, and there is going to be something for everyone in each.

Chris Nixon



Speed skating



Sound	9
Graphics	10
Playability	10
Value for money	10
Overall	10

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WINTER OLYMPIAD'88

Winter Olympiad'88 is undoubtedly the best winter sports simulation to date. It features the classic winter olympic events; Ski Slalom, Giant Slalom, Two man bobs, Ski-Jump, Biathlon and Speed Skating. These have been depicted in a way not seen on any home computer before. The result is a phenomenally realistic and spell-binding game.

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TYNESOFT
COMPUTER SOFTWARE

electron user

ARCADE CORNER

Compiled by MARTIN REED

MOST *Electron User* readers will know of the Slogger Master Ram board. Many, including Pendragon and I, are proud owners.

For a few months now, Pendragon has been bringing news of the many formerly BBC Micro-only adventures that now run on the Electron with the Master Ram Board, not to mention the new adventures that are being released specifically for the 64k Electron.

As yet, however, I don't know of any arcade games specifically designed for the expanded machine. Think of the amazing possibilities of a full 32k game with Mode 1 or 2 graphics. Such games would rival anything available for the BBC Micro or any other machine. What about two versions – one 32k and one 64k – on the same tape?

This month's pokes come from Justin Tyas from Woodham Ferrers, Essex, Mark Richardson from Barking, Essex, Jason Hassam from Stepney, London, Paul Shackels from Southgate, London, and Troy Helm from Carmarthen, Dyfed.

Share your hints, tips, peeks and pokes with fellow *Electron User* arcade addicts – but please ensure they are all your own work. Send them to:

Arcade Corner
Electron User
Adlington Park
Adlington
Macclesfield
SK10 5NP

Gisburne's Castle – Martech/Mastertronic

Alistair Fisher has written in from Thorpe Bay, Essex, with a plea for help with Martech's arcade adventure, Gisburne's Castle. He cannot open the trapdoor or the rusty door or get into the dungeons.

Alistair says he has had the game for nearly two years and is getting desperate. I have hardly played the game myself – perhaps some of our talented readers may be able to help? With the recent re-release of the game on Mastertronic's Ricochet label, I think we may be seeing more of Gisburne's Castle.

Omega Orb – Audi- genic

Omega Orb features a cheat mode: Logon to a computer and type GROVEL. This gives you an extra life and can be used any time.

Soccer Boss – Alterna- tive Software

If football management is not your strong point, here's a cheat for Alternative Software's Soccer Boss. After the game has loaded, press Break, then type

0L0
LIST 32

The value of your initial financial resources is held in CA%, and your starting division in DIV%. Change these values to obtain more cash or to start in a higher division.

Tarzan Boy – Alligata

Here's a simple tip for anyone who finds Tarzan Boy a bit slow – just press Break. This switches the sound off and causes the game to speed up. However, this only works once: If you press Break a second time the Tarzan Boy sprite will be corrupted, turning into a series of vertical lines. Be careful.

Starship Command – Acornsoft

This short routine for Acornsoft's Starship Command doubles the rate at which your starship's shields are replenished.

```
10 P1=85780  
20 CPT 2:PHF:PHA  
30 LDR rate:STA 834B5  
40 PLA:PLP:RTS: J  
50 rate=24  
60 %2228-B:8221=857  
70 +FX 14,4
```

Snapper – Acornsoft

Here's an unusual tip – a cheat for the rom version of Acornsoft's Snapper! Insert the cartridge and switch the machine on. Wait for about a second and press Escape. You should then be able to list the game's Basic loader. Delete line 40 and enter the following line:

80 100=RN0(0)

Then type RUN to load the rest of the program.

You will find you are only pursued by the red monster, and that you will be credited with the points of the current bonus fruit every time you pass your starting position, regardless of whether the fruit is actually displayed at the time.

Also, if you eat a power pill and catch the red monster – sending it back to its den – it will not come back out until you begin a new sheet. This allows you to complete the current sheet at your leisure.

Spy vs Spy – Tynesoft

Nathan Edmunds has written in with a request for help with Spy vs Spy. He has collected all the objects, but does not know how to put them in the briefcase.

He also wants to know which of them are actually needed to finish

the game.

To put an object into the briefcase, you must put the briefcase into the cupboard, safe or filing cabinet and take the object.

Then put the object back where you found it and take the briefcase.

The object is now in the case.

Objects in the briefcase show up as flashing symbols on the trapezoid. You only need four items – passport, key, plans and money – to leave the embassy and win the game.

1st. Software

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Character building

The first instalment of a new series by **ROBIN NIXON** on how to create your own character sets

OVER the next few months we'll be looking at ways of redefining the Electron's character set, seeing how to create new fonts for Epson-compatible printers and how to get a 40 character screen width in Modes 2 and 5, or even 80 characters in Mode 1.

This month we'll kick off with Program I, a font designer. It enables you to quickly and simply define and use complete character sets without having to type a single VDU 23 statement.

As you may know, to obtain more than 32 user-defined characters it is usually necessary to "explode" the character set by issuing a *FX20 command.

This can be a bit fiddly and results in the loss of 256 bytes per set of characters. As we need 96 characters to create a complete set, that makes a total 768 bytes of memory required.

There is, however, another way. On a disc-based system we can just about squeeze our character definitions in pages &9, &A and &C of memory.

Tape users will need to use page &B, the function key buffer, in place of &A as this is the cassette input buffer which will be used for loading in the character sets.

So long as we don't try to BPUT or BGET using the cassette filing system, or define more than four envelopes there will be no problems.

Now that we've found somewhere to put our character sets, we need to tell the computer where to find them. This is achieved by altering the locations in page &3 as shown in the panel on the next page.

However, we need only be interested in the following three fonts: 32-63, numbers and punctuation, 64-95, upper case letters and 96-127, lower case letters.

Numbers and punctuation can go in page &9, uppercase letters in page

&A (&B for tape users) and lowercase letters in page &C. So to set up the extra user-defined characters we have to change four bytes like this:

```
%367=&78 (bits 4 5 and 6)
%368=&9
%369=&A (&B for tape)
%36A=&C
```

The three bits set in location &367 tell the computer to take the selected fonts from the specified

pages in ram rather than the rom look up table. Ok so far, but we still have one problem — no user-defined characters.

Well, this bit's up to you. Using Program I define your three parts of the font and save each with a different filename, such as FONT-N, FONT-U and FONT-L, where N is numerical, U is upper case and L is lower case.

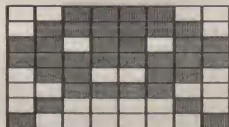
Then type in Program II, changing the filenames in lines 80-100 to those of your

new font. If you are using a tape system, don't forget to change the A00 in line 90 to 800 and the ?&369=&A in line 130 to ?&369=&B. You can now merge your programs on to the end with your new font replacing the Electron's standard one.

The character definer can also be used to create your own user-definable characters which need only be loaded in at &C00 saving

Turn to Page 22 ►

Character Definer R. Nixon 1988



Programming

◀ From Page 21

you typing VDU 23 statements and making your programs shorter.

● Next month we'll have a look at printing out the new

fonts on a Epson-compatible printer. In the meantime I'd be interested to receive any fonts you design: If there's room, I'll include a printout of the best one in a future article.

&900-&9FF Extra envelope storage area, envelopes 5-16.
Speech buffer.
RS423 output buffer.
Cassette output buffer.
&A00-&AFF Cassette input buffer.
RS423 input buffer.
&C00-&CFF User-defined characters 224-255.

&367 The font flag: This byte marks whether a particular set of 32 characters (font) is taken from rom or ram. If a bit is set the corresponding font is located in ram.

bit 6 characters 32-63
bit 5 characters 64-95
bit 4 characters 96-127
bit 3 characters 128-159
bit 2 characters 160-191
bit 1 characters 192-223
bit 0 characters 224-255

&368-&36E The font location bytes. These contain the high bytes for the location of each font. A font can only start at the beginning of a page so the low bytes are always 0.

The main areas of memory used

Program 1

```
10 REM Character set
20 REM definer
30 REM
40 REM By Robin Nixon
50 REM (c) Electron User
60 REM
70 DIM C% 8, A%(8,8), OS%
80 MODE 5:VDU23:GOTO 802:0
90:RRZ=12:SSZ=5
100:CLS=0
110:RRZ=12:SSZ=5
120:VU 19,1,4,0,0,0
130:VU 19,1,4,0,0,0
140:VU 19,1,4,0,0,0
150:VU 19,1,4,0,0,0
160:VU 19,1,4,0,0,0
170:VU 19,1,4,0,0,0
180:VU 19,1,4,0,0,0
190:VU 19,1,4,0,0,0
200:VU 19,1,4,0,0,0
210:VU 19,1,4,0,0,0
220:VU 19,1,4,0,0,0
230:VU 19,1,4,0,0,0
240:VU 19,1,4,0,0,0
250:VU 19,1,4,0,0,0
260:VU 19,1,4,0,0,0
270:VU 19,1,4,0,0,0
280:VU 19,1,4,0,0,0
290:VU 19,1,4,0,0,0
300:VU 19,1,4,0,0,0
310:VU 19,1,4,0,0,0
320:VU 19,1,4,0,0,0
330:VU 19,1,4,0,0,0
340:VU 19,1,4,0,0,0
350:VU 19,1,4,0,0,0
360:VU 19,1,4,0,0,0
370:VU 19,1,4,0,0,0
380:VU 19,1,4,0,0,0
390:VU 19,1,4,0,0,0
400:VU 19,1,4,0,0,0
410:VU 19,1,4,0,0,0
420:VU 19,1,4,0,0,0
430:VU 19,1,4,0,0,0
440:VU 19,1,4,0,0,0
450:VU 19,1,4,0,0,0
460:VU 19,1,4,0,0,0
470:VU 19,1,4,0,0,0
480:VU 19,1,4,0,0,0
490:VU 19,1,4,0,0,0
500:VU 19,1,4,0,0,0
510:VU 19,1,4,0,0,0
520:VU 19,1,4,0,0,0
530:VU 19,1,4,0,0,0
540:VU 19,1,4,0,0,0
550:VU 19,1,4,0,0,0
560:VU 19,1,4,0,0,0
570:VU 19,1,4,0,0,0
580:VU 19,1,4,0,0,0
590:VU 19,1,4,0,0,0
600:VU 19,1,4,0,0,0
610:VU 19,1,4,0,0,0
620:VU 19,1,4,0,0,0
630:VU 19,1,4,0,0,0
640:VU 19,1,4,0,0,0
650:VU 19,1,4,0,0,0
660:VU 19,1,4,0,0,0
670:VU 19,1,4,0,0,0
680:VU 19,1,4,0,0,0
690:VU 19,1,4,0,0,0
700:VU 19,1,4,0,0,0
710:VU 19,1,4,0,0,0
720:VU 19,1,4,0,0,0
730:VU 19,1,4,0,0,0
740:VU 19,1,4,0,0,0
750:VU 19,1,4,0,0,0
760:VU 19,1,4,0,0,0
770:VU 19,1,4,0,0,0
780:VU 19,1,4,0,0,0
790:VU 19,1,4,0,0,0
800:VU 19,1,4,0,0,0
810:VU 19,1,4,0,0,0
820:VU 19,1,4,0,0,0
830:VU 19,1,4,0,0,0
840:VU 19,1,4,0,0,0
850:VU 19,1,4,0,0,0
860:VU 19,1,4,0,0,0
870:VU 19,1,4,0,0,0
880:VU 19,1,4,0,0,0
890:VU 19,1,4,0,0,0
900:VU 19,1,4,0,0,0
910:VU 19,1,4,0,0,0
920:VU 19,1,4,0,0,0
930:VU 19,1,4,0,0,0
940:VU 19,1,4,0,0,0
950:VU 19,1,4,0,0,0
960:VU 19,1,4,0,0,0
970:VU 19,1,4,0,0,0
980:VU 19,1,4,0,0,0
990:VU 19,1,4,0,0,0
```

This is one of hundreds of programs available FREE for downloading on

MicroLink

In addition to these many BBC Micro programs in the MicroLink library will also appear on the Electron

```
400:RRZ=12:SSZ=5
410:RRZ=12:SSZ=5
420:VU 19,1,4,0,0,0
430:VU 19,1,4,0,0,0
440:VU 19,1,4,0,0,0
450:VU 19,1,4,0,0,0
460:VU 19,1,4,0,0,0
470:VU 19,1,4,0,0,0
480:VU 19,1,4,0,0,0
490:VU 19,1,4,0,0,0
500:VU 19,1,4,0,0,0
510:VU 19,1,4,0,0,0
520:VU 19,1,4,0,0,0
530:VU 19,1,4,0,0,0
540:VU 19,1,4,0,0,0
550:VU 19,1,4,0,0,0
560:VU 19,1,4,0,0,0
570:VU 19,1,4,0,0,0
580:VU 19,1,4,0,0,0
590:VU 19,1,4,0,0,0
600:VU 19,1,4,0,0,0
610:VU 19,1,4,0,0,0
620:VU 19,1,4,0,0,0
630:VU 19,1,4,0,0,0
640:VU 19,1,4,0,0,0
650:VU 19,1,4,0,0,0
660:VU 19,1,4,0,0,0
670:VU 19,1,4,0,0,0
680:VU 19,1,4,0,0,0
690:VU 19,1,4,0,0,0
700:VU 19,1,4,0,0,0
710:VU 19,1,4,0,0,0
720:VU 19,1,4,0,0,0
730:VU 19,1,4,0,0,0
740:VU 19,1,4,0,0,0
750:VU 19,1,4,0,0,0
760:VU 19,1,4,0,0,0
770:VU 19,1,4,0,0,0
780:VU 19,1,4,0,0,0
790:VU 19,1,4,0,0,0
800:VU 19,1,4,0,0,0
810:VU 19,1,4,0,0,0
820:VU 19,1,4,0,0,0
830:VU 19,1,4,0,0,0
840:VU 19,1,4,0,0,0
850:VU 19,1,4,0,0,0
860:VU 19,1,4,0,0,0
870:VU 19,1,4,0,0,0
880:VU 19,1,4,0,0,0
890:VU 19,1,4,0,0,0
900:VU 19,1,4,0,0,0
910:VU 19,1,4,0,0,0
920:VU 19,1,4,0,0,0
930:VU 19,1,4,0,0,0
940:VU 19,1,4,0,0,0
950:VU 19,1,4,0,0,0
960:VU 19,1,4,0,0,0
970:VU 19,1,4,0,0,0
980:VU 19,1,4,0,0,0
990:VU 19,1,4,0,0,0
```

```
360:VU 19,1,4,0,0,0
370:VU 19,1,4,0,0,0
380:VU 19,1,4,0,0,0
390:VU 19,1,4,0,0,0
400:VU 19,1,4,0,0,0
410:VU 19,1,4,0,0,0
420:VU 19,1,4,0,0,0
430:VU 19,1,4,0,0,0
440:VU 19,1,4,0,0,0
450:VU 19,1,4,0,0,0
460:VU 19,1,4,0,0,0
470:VU 19,1,4,0,0,0
480:VU 19,1,4,0,0,0
490:VU 19,1,4,0,0,0
500:VU 19,1,4,0,0,0
510:VU 19,1,4,0,0,0
520:VU 19,1,4,0,0,0
530:VU 19,1,4,0,0,0
540:VU 19,1,4,0,0,0
550:VU 19,1,4,0,0,0
560:VU 19,1,4,0,0,0
570:VU 19,1,4,0,0,0
580:VU 19,1,4,0,0,0
590:VU 19,1,4,0,0,0
600:VU 19,1,4,0,0,0
610:VU 19,1,4,0,0,0
620:VU 19,1,4,0,0,0
630:VU 19,1,4,0,0,0
640:VU 19,1,4,0,0,0
650:VU 19,1,4,0,0,0
660:VU 19,1,4,0,0,0
670:VU 19,1,4,0,0,0
680:VU 19,1,4,0,0,0
690:VU 19,1,4,0,0,0
700:VU 19,1,4,0,0,0
710:VU 19,1,4,0,0,0
720:VU 19,1,4,0,0,0
730:VU 19,1,4,0,0,0
740:VU 19,1,4,0,0,0
750:VU 19,1,4,0,0,0
760:VU 19,1,4,0,0,0
770:VU 19,1,4,0,0,0
780:VU 19,1,4,0,0,0
790:VU 19,1,4,0,0,0
800:VU 19,1,4,0,0,0
810:VU 19,1,4,0,0,0
820:VU 19,1,4,0,0,0
830:VU 19,1,4,0,0,0
840:VU 19,1,4,0,0,0
850:VU 19,1,4,0,0,0
860:VU 19,1,4,0,0,0
870:VU 19,1,4,0,0,0
880:VU 19,1,4,0,0,0
890:VU 19,1,4,0,0,0
900:VU 19,1,4,0,0,0
910:VU 19,1,4,0,0,0
920:VU 19,1,4,0,0,0
930:VU 19,1,4,0,0,0
940:VU 19,1,4,0,0,0
950:VU 19,1,4,0,0,0
960:VU 19,1,4,0,0,0
970:VU 19,1,4,0,0,0
980:VU 19,1,4,0,0,0
990:VU 19,1,4,0,0,0
```

Program 11

```
10 REM Character set
20 REM loader
30 REM
40 REM By Robin Nixon
50 REM (c) Electron User
60 REM
70 MODE 6
80:VU 19,1,4,0,0,0
90:VU 19,1,4,0,0,0
100:VU 19,1,4,0,0,0
110:VU 19,1,4,0,0,0
120:VU 19,1,4,0,0,0
130:VU 19,1,4,0,0,0
140:VU 19,1,4,0,0,0
```

This listing is included in this month's cassette tape offer. See order form on Page 53.

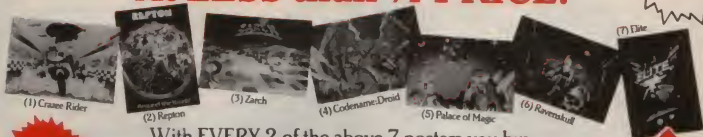
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Spreadsheet: Enables you to use your micro for home accounts or pocket money records. It creates a display of numbers in rows and columns. Continuous updating is possible, and a changed figure can be instantly reflected throughout the rest of the spreadsheet. Your results can be saved, to be used for future updates, or can be fed into its associated program

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cassette

RAINBOW is a powerful graphics program suitable for many drawing applications. It features advanced drag and rounding facilities to help take the rough edges off your designs.

The program works in Mode 5, thus giving four ink colours. It can draw lines, rectangles, circles and fill enclosed areas. It also provides several brush sizes and shapes and uses five drawing speeds.

After completing your work of art you can save your picture to disc or tape and later reload it.

In fact the only main feature it doesn't have is a screen dump to output the picture to the printer. This is because there are so many different printers and dumps that it was felt logical to leave dumping a saved screen up to you.

Rainbow has been made as easy to operate as possible. You only have to use the cursor keys and spacebar.

All functions are represented at the top and bottom of the screen as icons which can be accessed by moving the cursor to them and pressing the spacebar.

You can see these icons along with an explanation of their functions in Figure 1.

At start-up certain icons have been pre-selected: The

ink is set to red, the drawing speed is one and the pen has been selected.

On the screen you will see a flashing square box. This is the nib of the pen, brush or other icon you are using.

If you press the spacebar the computer beeps and the ink is turned on. If you then move the cursor, the pen draws on the screen. If you press the spacebar again the computer beeps and the ink is turned off. Once you've typed in the program, try practising with the options.

There are 10 icons at the top of the screen. The first four control the colour of the ink and the next five control the nib's speed.

Speed five is quite slow and so is ideal for intricate design work, as any slips of the nib will result in minimal

errors. On the other hand speed one is very fast and is useful for drawing large objects.

The tenth icon is erase. To avoid accessing this function accidentally you must select it twice. When you've finished practising with the top set of icons try out erase.

Now for the bottom 10 icons. First is the pen – the one you have been using until now, unless you've selected another option.

The next icon is scatter. This works in the same way as the pen, but draws a pattern of scattered dots.

The next two icons are the small and large brushes. They work in a similar way to the pen except that the ink comes out in one of two larger sizes.

Icon five at the bottom is line draw. If you take a look at Figure 2 you'll see that line draw enables you to

beeps at a different pitch to tell you it has remembered the position of the nib.

As you move the pen about, a line is dragged until you press the spacebar again, whereupon the line is placed on the screen.

The next icon, rectangle draw, is similar to line draw except that you can drag rectangles around the screen. Figure 3 shows how this works.

Looking at Figure 4 you will see that the seventh

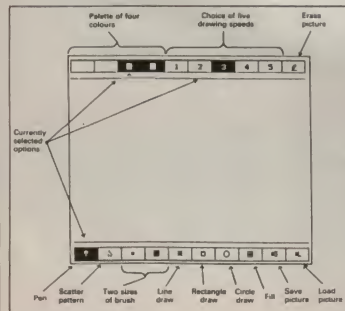


Figure 1: The screen icons

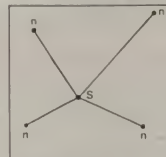


Figure 2: Using rubber-banding to drag lines from start position (S) to Nib position (n)

drag a line around until it is exactly where you want it before placing it on the screen.

When you press the spacebar the computer

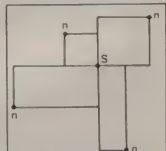


Figure 3: Dragging rectangles from start (S) to Nib position (n)

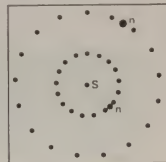


Figure 4: Dragging a circle's circumference from start position (S) to Nib position (n). Until the circle is drawn on the screen it is represented by a number of dots.

More great Electron games

This month we introduce a new volume in our Ten of the Best series – 10 more games to give you many hours of fun and entertainment.

These four packages are crammed with the best games from the last two years of Electron User. As an added bonus a previously unpublished game has been added to each one – stunning machine code masterpieces from our technical wizard, Roland Waddilove.

So give yourself a treat... with the most popular games compilations we've ever produced.



Volume 1

Jam Butty: Machine code simulation of high drama on a building site.
Gott: Play a round by yourself, or play against your pals.
Haunted House: Fight against all the odds to get out alive.
Space Hike: Another classic. Help the spaceman avoid marauding monsters.
Park's Peril: Help Parky through an invisible maze, racing against time.

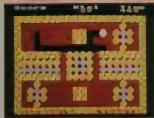
Rally Driver: All the thrills of high-speed driving with none of the risks.
Alphaswap: Your letters are in a twist. Can you put them in order.
Knockout: Fast and furious action as you batter down a brick wall.
Money Maze: Avoid ghosts and collect coins in an all-action arcade classic.
Lunar Lander: The traditional computer game specially written for the Electron.

Volume 2

Atom Smash: Machine code thrills as you help to save the world from destruction.
Bunny Blitz: Go egg collecting, but keep away from proliferating rabbits.
Castles of Sand: Build castles – but beware the rising tide and hungry sandworms.
Reaction Timer: Test your reactions with this traffic lights simulation.
Solitaire: The Electron version of the age-old game

of logic and patience.
Jumper: Jump for your life in this exciting arcade action game.
Break free: Test your wits and reflexes in this popular classic ball game.
Code breaker: Crack the code in a colourful if frustrating brainteaser.
Parashute: Save the plunging sky divers from a watery end.
Star fighter: Attack the bandit ships in this fast-moving 3D punch up.

Volume 3



Rockfall: Come diamond mining in this fun packed game with its own screen designer.
Karate Warrior: Win your black belt in this gruelling test of karate skill.
Grand Prix: Battle your way into the lead in this tricky racing simulation.
Invasion Force: Can you survive wave after wave of relentlessly advancing aliens?
Greblit: Guide the frog across the busy road then across the fast-flowing river!

Fruit Worm: Steer the worm towards the fruit while avoiding rocks and its ever-growing tail.
Manic Mole: Watch out for melting platforms and conveyor belts in your quest for jewels.
Skramble: Fly your fighter fast and low over the landscape to penetrate enemy territory.
Mr. Freeze: You'll need speed and strategy to reach the ice blocks before they melt away.
Paint Roller: Steer a speeding roller, run over paint pots but keep clear of the rocks.

Volume 4



Lunar Invasion: Defend the moon from wave after wave of marauding aliens in this superb multi-screen arcade game.
Howzat: Try not to get caught out in this vivid recreation of a day's test cricket.
Snappdragon: Enjoy this two-player micro version of the familiar card game.
Day at the Races: Fancy a flutter? You can bet your shirt in safety in this two-player horse racing game.
Reversi: Combine cunning and chance as you try to out-think your Electron at this classic

board game.
Fishing: Relax and enjoy a quiet afternoon by a shady brook. You'll regret if you let this one get away.
Cavern Capers: Escape from the depths of the planet by blasting oil drums and dodging deadly fireballs.
Creal: Escape from the maze and win the beautiful princess in this superb text adventure.
Oxo: High strategy meets low cunning in a logic game to strain your brain.
Missile Attack: Defend your city from a missile invasion and save it from certain doom.

NEW

TO ORDER PLEASE USE THE FORM ON PAGE 53

icon, circle, is slightly different from the previous ones.

Once you've pressed the spacebar to register the centre of a circle you will see a series of dots appear in a ring. These spread out as you move the cursor.

The circumference of the circle represented by the dots lies exactly on your new nib position. The dots are used because drawing circles in Basic takes a long time and you would not be able to achieve the real time dragging effect.

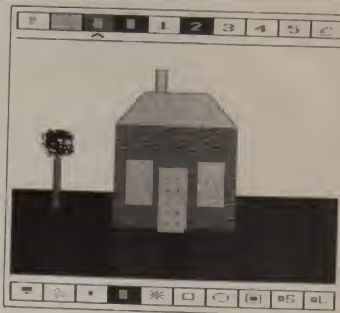
The fill icon is a partial fill routine. When you press the spacebar with the fill icon

selected, the area underneath is filled in with the current ink.

As this is only a partial fill it may take three or four goes to fill an object entirely.

The last two icons are to save and load pictures. As their names suggest, these options either save or load the picture to or from disc or tape. The picture is saved under the filename PICTURE.

If you are using a tape recorder make sure you have wound the cassette to the correct place when saving or loading as none of the normal messages will be displayed.



```
10 REM      RAINBOW
20 REM
30 REM By Robin Nixon
40 REM (c) Electron User
50 REM
60 MODE$=VDU 23;820;0;0
;:
70 PROCINIT:RLES=OPT 1
;:
80 PI=640:QI=512:FX16
90 VDU 26,0,1,39,0
100 VDU 19,0,6,0,0,0
110 VDU 19,1,0,0,0,0
120 VDU 19,2,1,0,0,0
130 VDU 19,3,2,0,0,0
140 VDU 23,240,73,42,20,1
150 VDU 23,241,0,126,66,6
160 VDU 23,242,60,60,129,
170 VDU 23,243,255,129,18
180 VDU 23,244,14,26,50,1
190 VDU 23,245,15,233,232
200 VDU 23,246,0,232,232,
210 VDU 23,249,62,62,62,6
220 VDU 23,250,10,0,34,0,
230 VDU 23,251,0,0,24,24,
240 VDU 23,252,0,0,0,0,0,
250 VDU 23,253,0,0,0,24,2
260 VDU 23,254,255,195,16
270 VDU 23,255,62,34,34,4
280 VDU 24,0,96;1279;927;
290 GCOLB,129;CIG:VDU 26
300 GCOLB,3;MOVE 0,1023;D
310 VDU 1279,1023;DRAW 1279,903
;:DRAW 0,903
```



```
300 MOVE 0,0;DRAW 1279,0;
DRAW 1279,64;DRAW 0,64;MOVE
0,92;DRAW 1279,92
310 MOVE 0,931;DRAW 1279,
931
320 FORXI=0 TO 1279 STEP 128:
MOVE XI,1023;DRAW XI,963;MO
VE XI,0;DRAW XI,64;NEXT
330 VDU$=FORXI=0 TO 3:MOVE
XI=128+X,1019;PROCBOX(0,XI);
GCOLB,XI
340 MOVE XI=128+32,1004;V
DU$2;NEXT:GCOLB,2
350 FORXI=1705;MOVEXI=128
+420,1000;VDU$2;NEXT:MOVE
XI=104,1000;VDU$2
360 GCOLB,2;FORXI=1704;MO
VEXI=128-96,40;VDU$2;NEXT:
NEXT
370 FORXI=1704;MOVEXI=128
+476,40;VDU$2;NEXT:FORXI=
1704;MOVEXI=128-934,40;VD
U$2;NEXT:NEXT:NEXT
380 XI=640;YI=512;XI=640
;YI=512;X2=XI+64;Y2=YI+12;G
COL$2;PLOT4,XI-32,YI-12
390 VDU$255;GCOLB,3;YI=51
2;X1=2;X2=1;R2=4;C2=2;B2=0;
B2=1;C2=0;B2=0
400 EFT=0;R2=0;SF1=0;C
F=0;CF=XB;CF2=0;B2=0;FF
=0;WF=0;M=0
410 MOVE 303;128+4,0;X32
=0;Y31=0;PROCBOX(4,0)
```

```
550 IF (Y2=990 AND Y1=990
0) AND EFT=1 GCOLB,0;DRAW X
2,Y2;PLOT69,X2,Y1;GCOLB
,C1:EFT=0
560 IF (Y2=64 AND Y1=64)
AND EFT=1 GCOLB,0;DRAW X2
,Y2;PLOT69,X2,Y1;GCOLB,C
1:EFT=0
570 IF EFT=1 GCOLB,0;ORA
W X2,Y2;DRAW X1,Y1;GCOLB,C
1;GOTO650
580 IF SF1=1 AND Y2=990
AND Y1=64 AND R2=5 SF1=1: E
LSE IF (Y2=990 AND Y1=990)
OR (Y2=64 AND Y1=64) AND
SF1=1 SF1=0
590 IF SF1=1 GCOLB,0;MOV
E XI,Y1;DRAW X1,Y1;DRAW X2
,Y2;DRAW X2,Y1;DRAW X1,Y1;
DRAW X1,Y2;DRAW X2,Y2;ORA
W X2,Y1;DRAW X1,Y1;GCOLB,C
1;GOTO650
600 IF R2=1 AND R1=5 MOVE
XI=32,Y1=12;VDU$2;GOTO650
610 IF CF=1 AND Y2=990
AND Y1=64 AND R2=5 CF=1
ELSE IF (Y2=990 AND Y1=990)
OR (Y2=64 AND Y1=64) AND
R2=1 CF1=0
620 IF CF1=0 GCOLB,0;X1=
SQR(ABS(X1-X2))+ABS(X1-X2);
ABS(Y1-Y2)+ABS(Y1-Y2);IF
OR X1=0 TO :FOR X1=0 TO 30
STEP 4:PLOT 69,X2,X1+X1;X1
,Y1;Y2;X1+X1;X1;X1;X1
;NEXT X1;X1=0;GCOLB,C1;GOTO6
50
630 IF FFI=1 AND Y1=64 AND
Y2=990 AND R2=5 PROCI=1
;GOTO650
640 PLOT69,X1,Y1;Y2=Y1-1
;X1=X1
650 GCOLB,2;PLOT4,X1-32,Y1
=12;VDU$2;GCOLB,C1;X1=X1
;Y1=Y1
660 UNTIL 0
```

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Utility

From Page 27

```

670 DEFPROC:anoff:REPEAT U
NTIL NOT INKEY -99
680 SX=X1-64:128:IF Y1<>
992 GOT0750
690 IF Y1<0 AND SX=9 MOV
E 156,1019:PROCBOX(4,0):W
1:0
700 IF SX<4 MOVE CX+120+3
2,952:GCOL4,0:V0U94:CX=SX:M
OVE CX+128+32,952:V0U94:GC
OL4,0:GOT0960
710 IF SX=9 WFX=WFX+1:MOV
E 1156,1019:PROCBOX(4,0):S0
UND1,-15,120,1:IF WFX=2 WFX
+0:V0U24,0:96:1279:927:GC0
L0,129:CLS:V0U26
720 IF SX=9 GOT0960
730 MOVE (N1/2+3)+120+4,1
019:PROCBOX(4,0):N1=(SX-3)+
2:MOVE (N1/2+3)+120+4,1019:
PROCBOX(4,0):N1=(5-15-41)+
8:GOTO 960
740 GOT0960
750 IF WFX=0 MOVE 1156,101
9:PROCBOX(4,0):WFX=0
760 IF Y1<36 GOT0910
770 IF SX<8 MOVE BX+120+
4,0:PROCBOX(4,0) ELSE SOUN
D1,-15,120,1
780 IF SX<8 EFX=0:SFZ=0:C
FX=0:BFZ=0:FFZ=0

```

```

790 ON SX+1 GOT0 800,810
,810,810,820,830,840,850,86
,860
880 BFZ=0:GOT0900
890 BFX=SX+249:BF1=1:GOTO
900
820 EFX=1:X2=X1:Y2=Y1:G
OT0900
830 SFZ=1:X2=X1:Y2=Y1:G
OT0900
840 CFZ=1:X2=X1:Y2=Y1:G
OT0900
850 FFZ=1:GOT0900
860 MOVE SX+120+4,0:PROC
BOX(4,0):SAVE PICTURE 5BC0
7C40
870 MOVE SX+120+4,0:PROC
BOX(4,0):GOT0960
880 MOVE SX+120+4,0:PROC
BOX(4,0):LOAD PICTURE 5BC0
890 MOVE SX+120+4,0:PROC
BOX(4,0):GOT0960
900 BBI=SX:MOVE BBI+120+4
,0:PROCBOX(4,0):GOT0960
910 IF EFX=1 GCOL3,2:PLO
T4,X1-32,Y1+12:V0UCR2:GC0
L0,CX:MOVE X2,Y2:DRAW X1,
Y1:GCOL3,2:PLOT4,X1-32,Y1+1
2:V0UCR1:GCOL0,CX:X2=X1:Y2
1=Y1:GOT0960 ELSE IF EFX=1
R1=5:GOT0960
920 IF SF1=1 GCOL3,2:PLO
T4,X1-32,Y1+12:V0UCR2:GC0

```

```

LB,CX:MOVE X1,Y1:DRAW X1,Y2
1:DRAW X1,Y2:DRAW X2,Y1:
DRAW X1,Y1:X2=X1:Y2=Y1:GC
OL3,2:PLOT4,X1-32,Y1+12:V0U
CR1:GCOL0,CX:R1=4:SF1=X0:G
OT0960 ELSE IF SFZ=1 R2=5:G
OT0960
930 IF CF1=1 SOUND1,-15,

```

This is one of hundreds of programs now available FREE for downloading on

MicroLink

In addition to these many BBC Micro programs will also run on the Electron

```

50,1:GCOL3,2:PLOT4,X1+32,Y2
1:V0UCR1:GCOL0,CX:V0U24
,0:96:1279:927:MOVE X2+L1
+AX(31,0)/100,Y2+L1+AX(31,
1)/100:FOR JX=0 TO 31:DRAW
X2+L1+AX(JX,0)/100,Y2+L1+
AX(JX,1)/100:NEXT:CFZ=1
940 IF CF2=1 V0U26:X2=X
1:Y2=Y1:R1=0:CF1=0:GCOL3,
2:PLOT4,X1-32,Y1+12:V0UCR
1:GCOL0,CX:CF2=Y1:ENDPROC
950 IF R1=5 R1=4:FX=1:GOT
0960 ELSE R1=5:FX=0
960 SOUND1,-15,100:R1=450
1:ENDPROC
970 DEFPROCBOX(BCX,CCX):P
LOT 0,0,0:GCOL0,CX:PLOT0

```

```

,100,0:PLOT81,-100,-54:PLOT
0,0,0:PLOT8,100,0:PLOT81,0,
50:ENDPROC
980 DEFPROC:nt:circle:DIH
AX(32,1):X0=0:FOR A=P1 TO P
1+3 STEP P1/16:AT(X0,0)=SIN
(A)+100:AT(X1,1)=COS(A)+100
:X0=X1+1:NEXT:ENDPROC
990 DEFPROC:ll:Y1=YX:BC
X=POINT(XZ,YZ):IF BCX<CX EN
DPROC
1000 GCOL0,BCX+120:PROC:nd
dle(4):PROC:nddle(4):MOVE
X1,Y1:R1=4:SOUND1,-15,120,1
:ENDPROC
1010 DEFPROC:nddle(00X):Y4
1=Y1:PLOT77,X1,Y1:Z1=1:6314
MOD 61000+8:Z2Z1=6310 MOD
610000
1020 REPEAT X4=Z1X+Z2Z1-21
3/2:MOVE X4,Y4:PLOT77,X4
1,Y4:Z1=1:6314 MOD 61000+8
:Z2Z1=6310 MOD 610000:Y4Z1
Y4+DD1
1030 UNTILPOINT(X4,Y4)<>
BCX OR Y4Z1=927 OR Y4Z1=96:EN
DPROC

```

This listing is included in this month's cassette tape offer. See order form on Page 53.

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WE have seen recently that even the professional weather forecasters with all their super computers can't always forecast the weather properly.

In my household, the cat will accurately tell us what the weather's like. If he won't stir from his chair to go outside, the chances are it's cold, wet or both.

Seriously though, this month we start on some interfaces that will allow us to monitor certain aspects of the weather, so you'll be able to keep a record of weather conditions.

Future articles will detail software, and also a bit of general information about the weather. You'll also find that the circuits we consider will be of use in other applications as well, so even if you're not a budding meteorologist, read on.

The first circuit we'll build is for a thermometer — an instrument that not only allows us to measure the current temperature, but with suitable software will also give us a maximum and minimum. It will automatically record the highest and lowest temperatures recorded since the computer was turned on.

The temperature sensor circuit is based upon the differential amplifier we looked at last month. I used a silicon diode for the temperature sensor, and the

circuit is shown in Figure 1.

The preset resistor VR1, is a bit like the potentiometer we first met in part four of this series. It's a component whose electrical resistance we can vary, though for a preset resistor we use a screwdriver or something similar to adjust the resistance.

Presets are used where we need to adjust a circuit very infrequently. In this case, we use the preset to adjust the zero degrees C reading for each thermometer to be the same.

The amplifier used is the useful little CA3140. As we mentioned last month, unlike most operational amplifiers, the 3140 is quite happy to run off +5V, without a -5 volt supply. This means we can power

the circuit directly from the Plus 1.

It doesn't take very much current, so we won't be in danger of overloading the Electron's power supply.

In this circuit the resistor values used are quite important as they set the gain, and hence the behaviour, of the circuit. Stick to the values given, and use five per cent tolerance components if at all possible.

Ok, let's start building. A piece of stripboard is used, and in addition to the parts on the circuit diagram you'll need a socket for the operational amplifier.

Apart from cutting out the risk of damage while soldering, it allows you to get the op amp out of the board and use it for other projects if you need to.

The socket required is called an 8-pin DIL socket and is available from most electronic component stockists. In addition, you'll need a 3.5mm jack plug and socket for the temperature probe. (Figure 1.)

Eventually we'll be putting all the weather monitoring circuits into one box, so for the time being we'll leave them uncased.

The layout of the stripboard is shown in Figure 1, where as usual, X marks the tracks which need to be cut.

Solder in the wire links first, followed by the DIL socket, then the resistors.

Now check everything, especially the track breaks and the soldering below the socket. It's surprisingly easy

to put a blob of solder across two tracks.

Finally, build the temperature sensor. Take care to get the diode the right way around. If you're quite sure all is well, you can plug in the operational amplifier.

Turn off the Electron and connect the circuit to the Plus 1 analogue port.

The circuit is connected to a terminal block by wires which are pushed into the terminal block holes and then the screws tightened up. At this point, we can plug in the temperature sensor.

Turn on the Electron. If all is well the computer will behave normally. Put your finger on the operational amplifier chip. It shouldn't be hot. If it is, turn the micro off and check your wiring.

Now for the fun part. Using Program 1, adjust the preset until a value of about 150 is displayed on the screen:

```

5 REM Program 1
10 REPEAT
20 PRINTAB(10,10) ;FN
ADVAL;
30 UNTIL FALSE
40 :
50 BEFFNADVAL:=INT(ADVAL*1
72567
    
```

Now hold the diode end of the temperature probe between your fingers. The reading should gradually increase as the temperature of the probe rises.

Then let the diode cool down — or help it by putting it in the fridge or freezer

Turn to Page 30 ▶

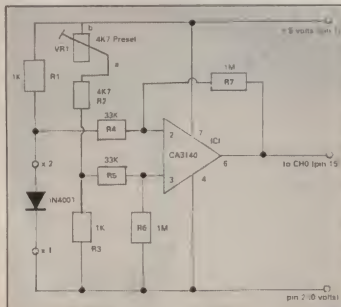


Figure 1: The temperature sensing circuit

Hardware Projects

◀ From Page 29

You should see the reading fall.

If this occurs, congratulations, you have a working thermometer. If not, check the wiring.

The easiest mistake to make is the diode connection. Check it's the right way round. If it is, check that the operational amplifier is in the socket the right way around, and check all your connections again.

I decided that we should try and cover a temperature range from a little below zero degrees Celsius to around 40 degrees. This will cover most situations, assuming Britain doesn't suddenly go tropical or start an ice age.

The first point to mark is the zero point. Keep the program running and mix some ice cubes and cold water. Let them stand for a while, and while there is still solid ice in the water pop the temperature probe in (waterproof it first with tape!).

Give it a quick stir, then leave it for five minutes to allow the probe to get to the surrounding water temperature.

Adjust the preset to get a reading of about 10 and record this somewhere. Call this value *temp0*.

You can use either a small screwdriver to adjust the preset or a filed-down knitting needle or piece of plastic rod.

The advantages of using plastic or any other non-conductor to adjust this component are that no variation of the signal due to the

electrical field picked up by your body is noted.

If you use a jeweller's screwdriver, the value returned by *FNadval* will flicker until you remove your hand.

This adjustment should be made carefully, as a small movement on the preset causes a relatively large change on the reading returned.

Now you'll need a normal thermometer and some warm water from the tap. Put the probe in the warm water – which should be around 35 degrees C – and again allow it to reach the water temperature.

Now record the reading taken on the thermometer, calling this value *temp*, and the reading displayed on the micro, call this *temp40*.

If the value displayed is above 255 either cool the water slightly or decrease the sensitivity of the thermometer.

Because the diode responds to temperature changes in a predictable fashion, we can now write a function to convert the reading returned by *FNadval* to a temperature.

What we need to do now is work out the relationship between the displayed value – between zero and 255 – and the temperature. So, first of all, calculate the following:

$$\text{counts per degree} = \text{temp} / (\text{temp40} - \text{temp0})$$

Here we're simply using the difference between the readings obtained at zero and *temp* degrees C to

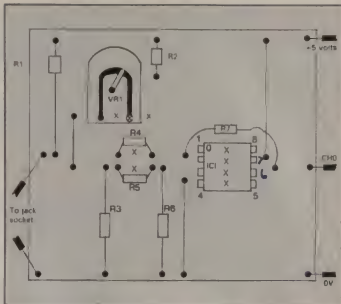


Figure III: Layout of the circuit

calculate the number of ADC counts returned by *FNadval* for a single degree.

Now, we can use this to convert any reading from *FNadval* in the range zero to 255 into a temperature in degrees C. The formula is:

$$\text{temperature} = (\text{reading} - \text{temp0}) / \text{counts per degree}$$

We need to subtract *temp0* from the *FNadval* reading returned because the circuit wasn't set to return a value of zero for zero degrees C.

As a worked example, one of my prototypes was set to record eight at zero. At 38 degrees a value of 252 was returned. Therefore:

$$\text{counts per degree} = (252 - 8) / 38 = 6.4$$

Assume now, that we have a reading from *FNadval* of 200. What is the temperature? Well, we simply say:

$$\text{temp} = (200 - 8) / 6.4$$

$$\text{temp} = 30$$

Program II is a short listing to return the correct temperature. You'll need to change the values of *counts-per-degree* and *temp0* to suit your own circuit.

If you need to vary the range of temperatures covered by this thermometer, then decrease the values of

the 33k resistors connected to pins 2 and 3 of the CA3140.

```

$HEM PROGRAM II
10 X=420209
20 REPEAT
30 PRINTTAB(10,10) ; F
  Ntemperature; C
  40 UNTIL FALSE
  50 :
  60 DEFFNadval
  70 =INT(ADVAL(10/256))
  80 DEFNtemperature
  90 =counts.per.degree*6.4
  100 temp0=17
  110 =(FNadval-temp0)/count
  ts.per.degree
  
```

This will decrease the gain of the amplifier and so increase the range of temperature covered, by virtue of the fact that a larger change in temperature will be needed to get a similar change in value returned by *FNadval*.

Calibration is just the same. If you want to experiment, try a value of 47k for each resistor. However, it's important to remember that both resistors must be the same value – if you change one, you must change the other as well.

● In the next instalment of the Electron User weather station, I'll detail some software for the thermometer, and also outline suitable housings for the diode probe in the garden. We'll also look at ways of measuring humidity.

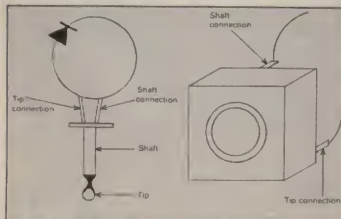


Figure II: 3.5mm jack socket



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LOOKING at the latest arcade games released by the software houses, you may wonder how they produce such amazing animated sprite-like characters.

The days of designing sprites on scraps of paper have long gone, and now all graphic artists and programmers have an array of tools and utilities they can call on to make the process much easier.

I first introduced the subject of sprites two and a half years ago in the July 1985 issue of *Electron User*. Since then we have had many requests for more information on this complex programming task.

In this article I'll present a sprite designer and next month we'll see how to print, move and animate our sprites on the screen.

Your first task is to enter and save the designer — the listing accompanying this article. Once this is done you can create some sprites

for next month's machine code routines to manipulate.

When the designer is run you'll be presented with the working screen. This shows the sprites you are working on, the current pen colour, pen status, sprite number and large, magnified copy of the current sprite. Figure 1 shows what the screen looks like during an editing session and clearly indicates the position of all the sprites, along with the designer's status.

When you first run the program you won't have any sprites on the screen, so let's create some.

All your drawing is carried out on the large magnified sprite in the centre of the screen. You can move the cursor using the cursor keys, set a pixel by pressing Copy and delete one by pressing Delete.

At the moment the pen is up, so you can freely move the cursor round the screen without drawing anything.

Let's bring your screen to life

Create animated characters with ROLAND WADDILOVE's easy-to-use sprite designer

Press P to put the pen down and move the cursor around — you'll see that it now leaves a trail in the current pen colour.

This mode is useful for painting large areas of the

sprite. One point to watch out for though — you can't delete anything by pressing Delete with the pen down as it draws the point again immediately you've deleted it. Either lift the pen up by pressing P again or select the background colour for the pen.

The currently selected pen colour can be changed by tapping the C key. All subsequent plotting with Copy or drawing with the pen down will be in the colour indicated.

You can fill the four available pens with different inks — equivalent to VDU 19 in Basic — by pressing I. You'll first be asked to input the pen number, followed by the new ink, 0-15.

If you've been experimenting with the commands so far you'll have noticed that whatever you draw in the large editing box is also repeated on a small scale in the top left corner of the screen. This is the sprite you are designing real-size.

You can work on up to four at any one time so let's leave sprite zero, the default one, and create sprite one. Press number 1 and after a slight delay you'll be presented with a clean editing box.

Now design a new sprite.





Cursor keys Move the cursor.
0-3 Select a sprite.
Shift+0-3 Copy the current sprite to 0-3.
AZ<> Scroll the sprite up, down, left and right.
P Pen up or down.
Copy Set a pixel.
Delete Delete a pixel.
S Save current sprite.
L Load current sprite.
C Select pen colour.
I Select ink (VDU 19).
N New sprite.

```

10 REM Sprite Designer
20 REM By R.A.Wadd Love
30 REM (c) Electron User
40 ON ERROR GOTO 170
55:OSCLI FX4:REPORT:PRINT
  at line "ERL:OSCLI FX12,4
:END
50 MODE 5
60 PROCInitialise
70 PROCscreen
80 PROCedit
90
100 DEF PROCInitialise
110 *FX16
120 *FX14,1
130 *FX12,7
140 VDU 19,15,7;0;
150 VDU 23,255,248,136,136
  ,136,248;0;
160 VDU 23,254,112,112,112
  ,0;0;
170 VDU 23;0202;0;0;0;
180 ENDPROC
190
200 DEF PROCscreen
210 DRAW 0,140:DRAW 1270,1
40:DRAW 1270,0:DRAW 0,0
220 MOVE 190,712:DRAW 990,
712:DRAW 990,180:DRAW 190,18
0:DRAW 190,712
230 COLOUR 15:PRINT TAB(1,
6)0 1 2 3TAB(12,3)
0)PenUpTAB(1,20)Sprite:0'
TAB(1,30)Pen:ICOLOUR 1:PR
INT;1
240 *x=0:y=0:GX=0:OY=0:CX
=1:PX=0
250 ENDPROC
260
270 DEF PROCedit
280 opt$="":*B123SLNPCI
,,:/
290 REPEAT K$=INKEY$9:PROC
cursor()
300 K$=INSTR(opt$,K$):IF K
$>1 THEN ON K$-1 GOSUB 1040,
1040,1040,1040,420,420,420,4
20,690,910,550,600,400,1130,
1190,1200,1300,1470
310 K$=ASC K$:IF K$=127 PR
OCplot()
320 IF K$=136 *x=x+(x,X)0)
ELSE IF K$=137 *x=x-(x,X)23
) ELSE IF K$=139 *y=y+(y,X)0
) ELSE IF K$=138 *y=y-(y,X)3
1)
330 PROCcursor(15):IF PX 0
R K$=135 PROCplot(CX)
340 UNTIL FALSE
350 ENDPROC
360
370 DEF PROCcursor(CX):GCO
LO,CX:MOVE 200*1+32,700*Y+1
6:VDU5,255,4:ENDPROC
380
390 REM ***** Colour *****
400 C$=(CX+1)MOD4:COLOUR C
$:PRINT TAB(5,30);C$;:RET
URN
410
420 REM *** New Sprite ***
430 ST=VAL K$:COLOUR 15:PR
INT TAB(8,20)K$
440 REM ** Print Sprite **
450 OY=51+1200/Y+CX*170
460 VDU 26,24,192,184,980;
710;16;26
470 FOR *x=0 TO 23
480 FOR *y=0 TO 31
490 Z$=POINT(OY+*x+8,991-y
1+4):IF Z$ PROCplot(Z$)
500 NEXT
510 NEXT
520 *x=0:*y=0:*fx170,255
530 RETURN
540
550 REM ***** New *****
560 FOR I$=1 TO 4:PRINT TA
B(51+5,I$):NEXT
570 VDU 26,24,192,184,980;
710;16;26
580 RETURN
590
600 REM ***** Pen *****
610 P$=NOT PX:COLOUR 15
620 PRINT TAB(15,30);:IF P
$ PRINT"Down" ELSE PRINT"Up
"
630 RETURN
640
650 DEF PROCplot(CX)
660 GCOL 0,CX:PLOT 69,0,X*

```

At any time you can press 0 to go back to the first sprite and 1 again to edit the second one.

When designing animated sprites with say, four frame animation, the frames are often very similar and usually there are just one or two changes each time.

To save time and effort, the current sprite you are working on can be copied to any other sprite by pressing Shift+0-4. If you are still working on sprite one press Shift+2 and it will be copied to sprite two. Don't forget you are still working on sprite one - if you want to work on this new sprite frame you'll have to press 2.

If at any time, you wish to completely erase a sprite and start all over again press N - New. Once this is done you can't get it back again so take care. Remember though, you can copy the current sprite to another one for safekeeping before erasing it.

All that remains is loading and saving. Press S to save the current sprite. Now use the cursor keys to enclose the portion of the sprite you wish to save - you don't need to save all of it. Press Return to confirm and then

enter the filename at the prompt.

It's always best to position the sprite in the top left corner of the editing box before saving it, otherwise you'll also be saving a lot of empty space. So before pressing S, (in fact, you can position it at any time) you can move it using <, >, * and ? to scroll it around the editing box.

Loading is much simpler - all you need to do is press L and enter the filename.

These commands always act on just the currently selected sprite, so first press 0-3 to select the one to load or save before pressing S or L.

Take care when inputting the filename as an error may cause the program to stop and display an error message, all you're work will then be lost. You can abort the command by just pressing Return when prompted for the filename.

● *That just about covers all the designer's commands. Table 1 gives a brief summary. Your task now is to create four sprites for next month, when I'll present a machine code sprite print routine.*

Turn to Page 35 ►

The Life Of Repton



REPTON AS A BABY



REPTON AT SCHOOL



REPTON AS A TEENAGER



REPTON AT WORK



REPTON AS AN OLD MAN



Repton fans have begged, cooed and pleaded with us to release another set of screens for our Repton 3 game. How could we refuse? Our lovable hero returns again to star in 40 new screens that vividly depict Repton's life-story.

The Five Ages of Repton: — At first we see Repton as a baby: a mewling infant surrounded by teddy-bears, humpy-dumpty, and aggressive clockwork toy-soldiers. Then Repton is a whining school-boy, creeping like snail unwillingly to school, with his pens, his calculator, and a bundle of homework. And then Repton during his teenage years becomes a spiky-haired punk armed with a ghetto-blastor and a collection of records. Then Repton goes to work: we see a harried office-manager amidst computers, photocopyers, and endless cups of coffee. Last scene of all, that ends this strange eventful history, is Repton as an old-age pensioner searching for his false-teeth, his spectacles, his "pint of stout", and his well-polished war-medals.



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THE CHARACTER EDITOR

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- the Repton 3 main program • the Repton 3 editor and • the 40 new game screens

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The screen pictures show the 88C Micro version of the game.

PRIZE COMPETITION

If you complete all 40 screens of The Life of Repton, you can enter our competition. Prizes include £200 in cash, with Repton mugs, badges, pens and certificates for runners-up.

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4 From Page 33

```

Z=8,991-Y1+4:MOVE 200+X1+32,
700-Y1+16:VDU5,254,4
670 ENDPROC
680
690 REM ***** Save *****
700 AZ=65940+5Z+80
710 X1=0:Y1=0
720 GCOL 3,15
730 REPEAT
740 MOVE 200,700-(Y1+1)=16
:DRAW 200+(X1+1)=32,700-(Y1+
1)=16:DRAW 200+(X1+1)=52,700
750 K1=GET:FX21
760 MOVE 200,700-(Y1+1)=16
:DRAW 200+(X1+1)=32,700-(Y1+
1)=16:DRAW 200+(X1+1)=52,700
770 X1=X1+(K1+136 AND X1=0
)-(K1+137 AND X1<23):Y1=Y1+(
K1+139 AND Y1=0)-(K1+138 AND
Y1<31)
780 UNTIL K1=13 AND X1=Y1>
0
790 IF X1=X1 DIV4
800 B1=6802:7600=X1:76001
*Y1
810 FOR X1=0 TO X1
820 FOR Y1=0 TO Y1
830 ?B1:(AZ+X1+8+6140*(Y1
DIV8)+Y1MOD8)
840 B1=B1+1
850 NEXT

```

```

860 NEXT
870 PROCInput("Save:");IF
names="" THEN RETURN
880 OSCLI"SAVE "+names+" B
00 "+STR$(B1+6800)
890 RETURN
900
910 REM ***** Load *****
920 AZ=65940+5Z+80
930 PROCInput("Load:");IF
names="" THEN RETURN
940 OSCLI"LOAD "+names+" B
00"
950 B1=6802
960 FOR X1=0 TO 7600
970 FOR Y1=0 TO 76001
980 ?(AZ+X1+8+6140*(Y1DIV8
)+Y1MOD8)=B1
990 B1=B1+1
1000 NEXT
1010 NEXT
1020 GOTO 440
1030
1040 REM ***** Copy *****
1050 AZ=65940+5Z+80:B1=6594
0+(X1+2)+80
1060 FOR Y1=0 TO 3
1070 FOR X1=0 TO 44 STEP 4
1080 ?(B1+X1+Y1+6140)=1(AZ
+X1+Y1+6140)
1090 NEXT
1100 NEXT
1110 RETURN

```

```

1120
1130 REM ***** VDU 19 *****
1140 PROCInput("Pen:");AZ=V
AL names
1150 PROCInput("New Ink:");
B1=VAL names
1160 VDU 19,AZ,B1,0;
1170 RETURN
1180
1190 REM ** Left Scroll **
1200 *FX178,0,0
1210 FOR X1=1 TO 24
1220 FOR Y1=0 TO 31
1230 GCOL 0,POINT(X1+8+0X,9
91-Y1+4):PLOT 65,0,-8,0
1240 NEXT
1250 NEXT
1260 GOTO 440
1270
1280 REM ** Right Scroll **
1290 *FX178,0,0
1300 FOR X1=22 TO 0 STEP -1
1310 FOR Y1=0 TO 31
1320 GCOL 0,POINT(X1+8+0X,9
91-Y1+4):PLOT 65,8,0
1330 NEXT
1340 NEXT
1350 GCOL 0,MOVE 01,991:DR
AW 01,991-31+4
1360 GOTO 440
1370
1380 REM *** Up Scroll ***
1390 *FX178

```

```

1400 FOR X1=1 TO 32
1410 FOR X1=8 TO 23
1420 GCOL 0,POINT(X1+8+0X,9
91-Y1+4):PLOT 65,0,-4
1430 NEXT
1440 NEXT
1450 GOTO 440
1460
1470 REM ** Down Scroll **
1480 *FX178
1490 FOR Y1=30 TO -1 STEP-1
1500 FOR X1=0 TO 23
1510 GCOL 0,POINT(X1+8+0X,9
91-Y1+4):PLOT 65,0,-4
1520 NEXT
1530 NEXT
1540 GOTO 440
1550
1560 DEF PROCInput(prompt$)
1570 VDU23,1,1,0;0;0;
1580 COLOUR143:COLOUR0:PRIN
TTAB(0,8)SPC19;CHR$13;prompt
$:INPUT names
1590 VDU 23;0202;0;0;0;
1600 COLOUR128:COLOUR15:PRI
NTAB(0,8)SPC20
1610 ENDPROC

```

This listing is included in this month's cassette tape offer. See order form on Page 53.

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The supreme council assembles and calls in you, Sebastian Jones, their finest star pilot and navigator extraordinaire.

His eminence, the Katarn explains that a priceless religious artefact, the Orb of Wisdom, has been stolen from the great temple.

The traitor has escaped along the Straits of Magellan, presumed to be heading for Rigel.

Although you've never held much store by an-

tiquities in the past, the offer of a hefty purse and instant fame appeals to you immediately.

Dare you venture into the most treacherous region of space to recover the Orb? Only you will know as you play Navigator.

The object of the game is to get from the top left of each screen to the exit gate at the bottom right. This is

achieved by moving left and right through the obstacles using the thrust key (Shift) to control your speed.

Be careful not to thrust in any direction for too long, because due to inertia the spacecraft keeps moving for a long time.

Crashing into the walls of the Straits or the asteroids is fatal, and you only have five lives.

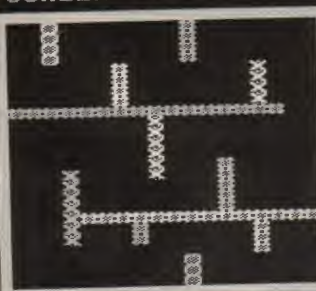
And even though Navigator is less than 2.5k long it has no less than six mazes and a virtually infinite number of asteroid-infested screens.

Mazes appear on the even numbered levels up to level 12, each more challenging than the last.

This remarkable game demonstrates the real power of Electron Basic. ■

MATHEW O'DONNELL presents a clever game of navigation in deepest space

SCREEN: 12 LIVES: 5



PROCEDURES
init Initialise game
instruct Display instructions

VARIABLES

L% Lives remaining
V% True if game paused
S% Current screen
H% Highest screen reached
X% X position of ship
Y% Y position of ship

```
10 REM Navigator
20 REM by MatheW O'Donnell
30 REM (c) Electron User
40 PROCinit
50 REPEAT
60 MODES
70 PROCinstruct
80 REPEAT
90 XZ=64:YX=892
100 FOR P=0 TO 999:NEXT
110 VDU 12,19,2,3;0;
120 VDU 17,1,17,130
130 FOR P=3 TO 29
140 VDU 31,8,P,225
150 VDU 31,19,P,225
160 IF P=3 OR P=29 PRINT#
B(1,P)STRING$(18,CHR$(225)):NE
```

```
XT ELSE NEXT
170 VDU 17,128,31,1;
180 PRINTSCREEN: LIVES
:;TAB(1,3);"HIGHEST SCREEN:
";
190 VDU 17,2,31,8,1
200 PRINT#S1;TAB(18,1);LX;
TAB(16,31);HX;
210 IF INT(SZ/2)=-SZ/2 OR
SZ=12 FOR P=1 TO (SZ+3)+2+C
CLRORND(2):PRINTTAB(RND(16)
+1,RND(25)+3):CHR$(RND(3)+225
):NEXT:GOTO 350
220 RESTORE
```

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Game

◀ From Page 37

```

230 REPEAT
240 READ a,b,c
250 UNTIL a=S+20
260 REPEAT READ a,b,c
270 COLOUR RND(2)
280 PRINT TAB(a,b);STRING
5(c,X,CHR$RND(3)+225))
290 UNTIL c=X
300 REPEAT
310 READ a,b,c
320 COLOUR RND(2)
330 PRINT TAB(a,b);STRING
5(c,X,CHR$RND(3)+225)+CHR$(
+CHR$8)
340 UNTIL c=X
350 PRINT TAB(19,25);STRING
5(4,CHR$32+CHR$8+CHR$10)
360 VDU 5,18,3,3
370 VDU 25,4,X,Y;224
380 Y=Y+1:Y=Y+1:Y=Y+1
390 REPEAT
400 W=X:X=Y
410 X=X+1:(INKEY(98)AND
X)=32:(INKEY(67)AND X=32)
420 G=GX:(GX<28)+2
430 Y=Y+X:X=Y+X
440 IF INKEY(1)=1:G=-30
:G=G-4
450 Q=POINT(X+1,Y+1)
460 R=POINT(X+4,Y+1)
470 I=POINT(X,Y+12)

```

```

480 Q=POINT(X+56,Y+12)
490 A=POINT(X+8,Y+20)
500 D=POINT(X+40,Y+20)
510 IF Q=1 OR Q=2 OR R=1
OR R=2 OR I=1 OR I=2 OR
O=1 OR O=2 OR A=1 OR A=2
OR D=1 OR D=2:EX=-1:TX=0:
SOUND0,-15,4,17
520 V=INKEY(-56)
530 REPEAT
540 UNTIL V=0 OR INKEY(-5
2)
550 MOVE N,M:VDU224
560 MOVE X,Y:VDU224
570 UNTIL X>1260 OR EX=-1
580 VDU4
590 L=L+EX:S=S+TX
600 J=(S>H)
610 H=X+L:X=X+H+NOT(J)
620 UNTIL L=X
630 VDU 17,3,28,1,16,18,14
,12
640 PRINT " G A M E O V E
R"
650 FOR P=0 TO 3000:NEXT
660 UNTIL 0
670 :
680 DEF PROCint
690 VDU 25,224,102,255,102,
255,126,219,153,66
700 VDU 25,226,126,235,213
,171,213,171,215,126
710 VDU 25,225,170,85,170,
85,170,85,170,85

```

```

720 VDU 25,227,102,255,235
,86,106,215,255,102
730 VDU 25,228,219,231,126
,60,60,126,231,21
740 X=X+1
750 ENDPROC
760 :
770 DEF PROCinstruct
780 VDU 23;820;0;0;0;
790 VDU 19,3,6;0;
800 VDU 19,1,5;0;
810 VDU 31,5,6
820 PRINT"NAVIGATOR
830 VDU 17,2
840 PRINT "SPC7Z - Left"
SPC7X - Right" SPC3"Shif
t - Thrust" SPC7P - Pause"
SPC7R - Resume"
850 "8212=8D6
860 "8213=GF1
870 "82AC=0
880 *FX16
890 *FX15
900 VDU 17,1,31,3,22
910 PRINT " Hit any key"
920 REPEAT UNTIL GET
930 CLS:S=X+1:L=X+5
940 ENDPROC
950 :
960 DATA 52,0,0,1,12,5
970 DATA 10,11,6,4,18,6
980 DATA 14,22,5,6,26,4
990 DATA 8,0,0,0,0,56
1000 DATA 0,6,4,11,10,0

```

```

1010 DATA 0,0,3,4,20,7
1020 DATA 17,12,13,12,12
1030 DATA 16,20,9,0,0,0
1040 DATA 50,0,1,19,5
1050 DATA 4,13,4,4,26,4
1060 DATA 7,0,3,12,11,4
1070 DATA 15,16,4,12,23
1080 DATA 4,0,0,0,3,6,10
1090 DATA 8,13,12,11,8
1100 DATA 21,0,0,0,60,0
1110 DATA 0,1,0,15,4,13
1120 DATA 15,1,18,15,4
1130 DATA 23,15,0,0,0,6
1140 DATA 26,1,12,24,1,9
1150 DATA 28,1,15,28,1,0
1160 DATA 0,0,62,0,0,1
1170 DATA 12,16,4,22,15
1180 DATA 0,0,0,4,18,7,3
1190 DATA 4,4,7,8,4,11,4
1200 DATA 4,15,8,4,9,13
1210 DATA 6,13,17,5,8,23
1220 DATA 11,21,26,3,5
1230 DATA 23,3,0,0,0,34
1240 DATA 0,0,0,0,0,3,11
1250 DATA 5,6,5,7,0,18,6
1260 DATA 11,10,6,13,20
1270 DATA 9,4,22,7,10,12
1280 DATA 7,0,0,0

```

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In this all-action machine code game, you are faced with the task of collecting every diamond buried in the maze with you before ascending to the next highest cave, and — hopefully — eventual freedom.

This is no simple task, as you are surrounded by vicious maze munchers who take great umbrage at the thought of their precious booty being lifted from under their yellow noses.

To make matters worse, the maze is full of magic mushrooms just itching to brush their fungal feelers

against you and sting you into oblivion.

And as if that weren't enough, some joker has poured a truckful of rocks down the cave. Negotiating your way past these while being pursued by a frenzied monster certainly raises the blood pressure.

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You control your small figure from the keyboard and can pause the action at any time by pressing P.

Your score, together with the number of remaining diamonds and lives, is shown below the maze. Each new cave contains more diamonds than the last — and the monsters get smarter.



Turn to Page 43 ►

PROCEDURES

assem	Poke in the machine code
initmaze	Set up screen map
initgame	Set up memory locations
left	Scroll window left
right	Scroll window right
up	Scroll window up
down	Scroll window down
dia	Update diamonds left
dead	Update lives left
maestro	Print title screen
welldone	Play fanfare

VARIABLES

score%	Current score
lives%	Number of lives remaining
level%	Current level
dia%	Number of diamonds left
hi%	High score
man%	Location of man

CONTROLS

Z	Left
X	Right
.	Up
?	Down
P	Pause





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Exploring printers part 2

Printing in overdrive

JULIA FORESTER runs a set of benchtests in Part 2 of her printer series for beginners

NO ONE could accuse a modern printer of being slow, yet in days not-so-long past, when daisy-wheels and golf balls were more common, printing was a slow and laborious task.

And before monitors became commonplace it used to be the only form of display. Unbelievable as it may now seem, computer programmers and operators had to work from paper printouts.

Thankfully, the days of the rattling teletype are little more than a faded memory – now we have to make do with luxuries like televisions, high-resolution colour monitors and so on.

Even so, there are still times when a hard copy of our work is required: The obvious instance is when we're sending a letter.

The document is prepared and edited in the computer, but unless we're able to use electronic mail it will have to be typed out on paper and sent by normal means. This involves using a printer.

Another case is listing programs. The monitor can only display a few lines at a time, 32 being the maximum on the Electron. However, when debugging our own programs we may need to look at areas many tens of lines apart.

This is where the hard copy is extremely useful. It's much easier to thumb through a few sheets of paper than to wade through line after line of screen output.

The Electron can transfer data at very high speed, but printers can only output it considerably more slowly. So, when the printer is busy, the computer has to wait before it sends more information – in effect the computer has to stop and wait for the printer to catch up.

To help overcome this, the Electron has a printer

buffer built in. This is organised as a FIFO queue – take a look at the accompanying panel for an explanation.

Characters wait in the buffer until the printer sends a signal to inform the computer it's ready to receive more data. On the standard Electron the buffer is 63 characters long. However, there are addons such as ACP's 256k ram packs which can be configured as partial printer buffers.

Some printers have their own, modestly sized buffers and larger capacity external devices are available. One, the MicroStuffer, reviewed in the September 1987 issue of *Electron User*, provides a massive 64k buffer.

Such units store characters from the parallel port as fast as the computer can send them, leaving the computer free to carry on very

quickly, and characters are output to the printer at the printer's speed. The problem with all such devices is that they don't come cheap.

In the final reckoning though, the speed of the printout is governed by the speed of the printer itself. Individual models vary considerably in how fast they operate. Manufacturers provide a lot of impressive sounding figures, but these can rarely be easily compared.

In fact, a lot of things govern how fast a printer is, not just the speed of its printing. For instance, there's the carriage speed – how fast the print head travels, and line feed – how fast the paper moves through the printer.

To compare speeds of a selection of printers I have devised a few simple

benchtests. These programs produced the results shown in Table 1. Rather than optimising the programs for a particular printer, all were run under the same conditions.

Program 1 is the most useful test. It gives the

```
10 REM Program 1
20 REM Test in draft pica
30 *FX 3 10
40 TIME=0:FOR N=1 TO 11:P
PRINT STRINGS(80, "+");NEXT:SU
=TIME
50 *FX 3
60 PRINT "Stop clock when
printer stops:INPUT "Enter
time in seconds I
70 PRINT "Run time:":S0/1
80: seconds"
80 *ps=11/1:lp=3600*ps:
PRINT "Lines per minute:lp
s=60
90 PRINT "Characters per s
econds:INT((80*11)/1)"Fan
old pages per hour:INT(lp/h
60)
```

Printer type	CPS draft/NLQ	LPM draft/NLQ	PPH draft/NLQ	Line feed in seconds	Head speed inches/sec	Price
Precision MH-4010	97/58	73/44	66/40	0.076	0.114	£424.35
Epson EX-800	80/40	60/30	54/27	0.076	0.125	£550
Panasonic KX-P1081	80/20	60/15	54/12	0.091	0.114	£178.25
Epson FX-80	58	44	40	0.152	0.159	N/a
Amstrad DMP-3000	55	41	37	0.197	0.17	£159

Table 1: Five dot matrix printers compared

overall printing speed in pages per hour (PPH) lines per minute (LPM) and characters per second (CPS).

Program II is used to test

```
10 REM Program II
20 REM Test line feed speed
30 W1=428509
40 VDU 2:TIME=0:FOR N=1 TO 100
50 PRINT Stop clock when
printer stops:INPUT Enter
time in seconds T
60 feed=T/60
70 PRINT Line feed speed=
'feed':seconds
80 W1=890A
```

the speed of the line feed, and Program III to test the head travel speed – this determines how fast a prin-

```
10 REM Program III
20 REM Test head speed
30 W1=428509
40 *FX 3,10
50 TIME=0:FOR N=1 TO 11:P
PRINT -;STRINGS(70," ");
NEXT:STIME
60 *FX 3
70 PRINT Stop clock when
printer stops:INPUT Enter
time in seconds T
80 PRINT Run time:ST/1
00:seconds
90 PRINT Head speed:1/T
/11/8: inches per second
```

ter can perform carriage returns.

Although not all printers had an NLQ feature, whenever possible Programs I and II were modified as appropriate and tested in this mode.

To use any of the the programs to test your own printer, type RUN, press Return and start timing simultaneously. Enter the time in seconds when prompted.

The results clearly show that you only get what you pay for. The fastest model proved to be the semi-professional Precision unit, which owes a lot to its four print heads.

Similarly Epson's EX-800 unit is fast, but very expensive although it does have a colour option. Of the

cheaper units, the Panasonic provides excellent performance at a reasonable price.

Although none of the printers appear to have achieved their quoted speeds, it has to be remembered these figures are relative and not absolute.

For instance, the timings for CPS have not taken into account the extra time taken for line feeds. In spite of this, we feel these figures are the ones most likely to be duplicated in normal use.

● In the next article we'll continue our investigation into the complexities of printers, examining graphics and bit image mode.



The Epson EX-800 colour printer

Buffers, queues and stacks

The terms buffer, queue and stack are used very frequently in computing, but what do they actually mean?

Very often when computer devices talk to each other, one will send information faster than the other can process it. This is true for everything from the keyboard to the cassette interface.

A buffer is an area of memory controlled by the computer to act as a cushion. Characters wait in a buffer until they are required.

The argument for a buffer can be likened to a machine producing pies faster than the packer can remove them from the conveyor belt. Very soon, there'll be a disaster

with all the pies ending up on the floor.

So the packer must have some way to stop this happening. He will tell the machine to stop making pies every time his hands are full. Similarly, a device can tell the computer when it's busy.

Since the packer can only hold one pie, the machine will spend a long time waiting for him to catch up.

Obviously this would not be very satisfactory, and one way to solve the problem would be to store the pies temporarily on a series of shelves – a buffer.

The machine could then make large batches of pies without having to

wait. The larger the shelves – the bigger the buffer – the more pies can be made at a time.

Queues and stacks are two forms of buffer. The queue is a FIFO or first in, first out buffer. The example above is a queue. A stack, on the other hand is a LIFO or last in, first out buffer.

A dustbin is probably the simplest example of a stack buffer. As you throw your litter away it enters the bin and goes to the top of the pile.

The pile gets higher until the dustbin is full. When the bin is emptied, the last item to enter it is the first to be removed and vice versa.

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MICRO MESSAGES

WHEN I first bought your magazine and read the Micro Messages section, I saw letter after letter starting with "I must congratulate you on having a fantastic magazine ...", and "What a brilliant magazine Electron User is ...".

At first I thought this was just a way of getting your letter printed, but after buying it for some months, I now realise that all the comments are true.

After typing in the Joystick Converter in the November 1987 issue, I found that it worked marvelously with Acornsoft's Magic Mushrooms and Meteors, Tynesoft's Phantom and Alligator's Blagger.

And there are probably many more games that can be introduced to the world of joystick control.

Finally, can you tell me how I can get the Electron's power socket fixed, as the computer keeps turning on and off while I am playing games? — Richard Smith, Chelmsford, Essex.

● Letters are published because of their own merit and not because the flattery goes to the editor's head! The joystick converter

Preaching to the converted

proved very popular and we would like to hear from other readers who have found games which will work with it.

Fixing your power socket should be fairly simple. Check both wires for dry joints or fractured strands. Re-solder if necessary, but if the socket itself has worn out you can buy a replacement quite cheaply from most electrical spares shops.

Santa's slip up

CONCERNING the listing for Santa On The Tiles in the December 1987 issue of Electron User, I have double checked my programming, but still keep getting No such variable at line 810. If there is a mistake could you give me a correction?

Also, is there any

significance in the fact that lines 1450 and 1460 are reversed, or is this a printing error? — Trevor R. Vaughan, Wood Green, London.

● As we have said in the past, all listings published in Electron User are taken straight from working programs on disc and fed direct into the typesetting machine. Any errors likely to fall through the net are usually very obscure ones which even the author may not have come across after hours of play.

Please check the whole program as a typing error elsewhere might not be reported until line 810 is executed. No such variable means you've accidentally spelt something wrong somewhere.

However, you are quite right about lines 1450 and 1460. But even if entered in the order shown, they would still execute correctly as the function key would

not be fetched from the buffer and executed until after the program ends at line 1460.

Fun with codes

I AM presently writing a spreadsheet program to suit my own requirements, but I don't know how to generate Ascii codes with Shift+Func and Shift+Control+Func, which can then be detected with GET or GETS.

The codes I require are from 150 upwards, and I have used *FX226, *FX227 and *FX228 which should change the base values for these function key combinations, but to no avail. — Andrew Wilson, Airth, Falkirk.

● Unfortunately, the Electron's keyboard is completely different from the BBC Micro's, and the *FX calls you mention are implemented differently on the BBC's little cousin.

Instead of Shift+Function, use Func plus the keys A to P. For Control+Function use Func plus the keys Q to Z. There is no equivalent of Shift+Control+function.

These key combinations on the Electron are referred to as firm keys, and to set their bases to return the Ascii codes 150 upwards you should use *FX226 and *FX227 as on the BBC Micro, but note that *FX228

Turn to Page 48 ▶

Starword or View — which is the best?

I HAVE a couple of small problems which you may be able to solve. First, which is the better word processor — Slogger's Starword or View?

Second, when I stop work I often save my View file as DOC, and when I return I begin the next part and save it as DOC1. How can I load both DOC and DOC1 into the computer and save them as one file? — Andrew Wing, Hockley, Birmingham.

● Answering your first question is rather difficult. Both word processors have their own merits, so it's up to you to decide which suits you best. Slogger's version is easier to get to grips with, while View tends to offer more advanced facilities, once you have spent time mastering it.

As to your second problem, we're not quite sure why you continue your work with a separate file. You

could load in DOC, continue adding to it, and resave it as DOC again.

However, the solution to tackling two or more View files together is simple. Load in the first file — in your case DOC — and then type READ DOC1. View will then load DOC1 into memory at the end of the text already present.

This can be done for as many files as your computer has memory for.

◀ From Page 47

is not implemented. Type in the following.

```
10 G+X 226,150  
20 GET:PRINT 6
```

Now run it and press Func+A. You should have 150 stored in G and also printed on the screen.

Accuracy not lost

AARRGH! Joe Pritchard does it again. I thought someone might have put him right after his *Hardware Projects* article in the May 1987 issue of *Electron User* where he states: "FX 190,n allows us to speed up the conversion time from 10mS to around 5 to 6mS. We do, however, lose a little accuracy."

"FX 190.8 does not lose any accuracy - you cannot lose what isn't there. The Plus 1 contains an eight-bit A/D converter, a National Semiconductor ADC0844 to be precise, a fact which is clearly stated in the Plus 1 User Guide on pages 1, 6 and 8.

Another misconception is from Chris Nixon who says that his excellent BOS editor (*Electron User* October 1986) cannot reside in pages 9 and 10 on tape based machines since it would be corrupted by the next SAVE or LOAD.

Not so. This area is not used by SAVE and LOAD, but by *SPOOL and *EXEC, as well as any operations involving opening cassette files.

I am sorry to sound carping, but people do rely on *Electron User* for information so I believe you should get it correct. Incidentally, Roland Waddi love's Mandelbrot program (May 1987) can be speeded up 10 per cent or more by adding the lines:

```
625 SET  
1385 CL1
```

which disable interrupts during the calculation. - Phillip A. Bender, Sunderland.

● Thanks for pointing out both Joe's and Chris's

ALL programs printed in this issue are exact reproduction of listings taken from running programs which have been thoroughly tested.

However on the very rare occasions that mistakes may occur corrections will be published as a matter of urgency. Should you encounter error messages when you type in a program

they will almost certainly be the result of your own typing mistakes.

Unfortunately we can no longer answer personal programming queries concerning these mistakes. Of course letters about suggested errors will be investigated without delay, but any replies found necessary will only appear in the mail pages.

misconceptions. However, Chris was working using the information contained in the Advanced User Guide, which is unclear.

As for Roland's Mandelbrot program, he was surprised that he forgot to disable interrupts - normally a hardened habit of his.

He adds that the Mandelbrot set is symmetrical about the horizontal axis, plotting could be speeded up by 50 per cent by just calculating the top half and duplicating a mirror image for the bottom: This will cut the time taken from around two hours to one hour.

This was only realised after the program had been published and it was too late to modify it. Perhaps you would like to modify it yourself? It shouldn't be too difficult

the *Electron* and BBC Micro. I have tried my local computer store, bookshop, and Watford Electronics without success, and I don't know who the publisher is. Can you help?

I buy your magazine monthly, and I think it is good value for money - C. Grant, Birmingham.

● If you mean the Basic Rom User Guide by Mark Plumley and published by Adder, Watford Electronics most certainly does stock it. There is also another Basic Rom User Guide by Colin Pharo, published by The Cambridge Microcomputer Center, 153-154 East Road, Cambridge.

Electron users only

In the December 1987 issue of *Electron User*, you included a routine to speed up the cassette filing system, by shortening the gaps between data blocks.

As a BBC Micro user, I

look the magazine home and typed it in. Apart from the warning "Electron OS 1.00 only" - the utility seemed to work until I tried saving a program and received the message Data? 00 and so on.

This utility seems such a useful one to me, and I would really find it helpful if you could publish a conversion for the BBC Micro. - Jon Breen, Taunton, Somerset.

● The warning message is there for a very good reason.

Although the *Electron* and BBC Micro are very similar, you just can't expect a complex routine like this one to run on what is essentially different hardware.

The Turbo Loader is a very accurately timed piece of code, and as such would need a complete rewrite for the BBC Micro.

Although many *Electron User* games and utilities run on the BBC Micro, this is one of the rare ones that doesn't.

Get rich quick!

I WOULD be grateful for information concerning payment for programs accepted by *Electron User*, and for hints on the required format of submitted listings and articles. - Haydn Griffiths, Gt. Yarmouth, Norfolk.

● We generally pay by the word. The actual amount can vary according to both the article and program quality, and the amount of editing needed to get the program and text up to scratch.

Programs would have to

Basic guide

DURING the past month I have been trying very hard to get hold of the Advanced Basic Rom User Guide for

In answer to Lee Harland's letter in the November 1987 issue. Yes, there is a free software library which is advertised in *Electron User* each month. It is the online database called MicroLink.

Connecting to this service has the added advantage of not having to laboriously type in the program listings each month.

But how do you connect to MicroLink? In fact, how do you attach a modem and communication package to the *Electron*? - Andrew Pickles, Brentwood, Essex.

● Pace Miracle Technology offers a modem, RS423 interface and Commstar - everything you need to log on to MicroLink. You'll need a Plus 1 if you haven't

already got one, and the price is £148.58. Contact Pace at: Pace Miracle Technology, Juniper View, Allerton Road, Bradford BD15 7AG, or telephone 0274 488211.

Alternatively, Slogger offers an RS423 and Commstar software. You'll need to add a modem to this.

Free software galore!

be very good indeed to justify the top rate, so the average payment would be slightly less than this.

Send your articles in on disc if possible, otherwise tape will do.

And use a word processor such as Mini Office, View or Starword. However, if you can't, don't worry - send it on paper.

It is the programs themselves that must be supplied on tape or disc, with the format clearly marked on the cassette or disc itself. We can't type in listings.

Always mark all parts of a submission clearly with your name, address and telephone number if possible.

We can then get in touch to either return the work with suggested improvements, or post the payment.

Payment is always upon publication.

Locked out

I HAVE been reading your excellent magazine for some time now, and I wonder if you could help me with some problems I am having with my Electron?

How do you lock files? I have a short program to load in locked files, but am having trouble saving my own.

```
10 MODE 1:FOR N=0 TO 50
20 DRAW RND(1200),RND(100)
40: NEXT
50 Y=B0:X=0:Z=1
60 PROC(X,Y):REPEAT
50 UNTIL GET:GOTO 30
60 DEFPROC(X,Y):FOR X=X
TO Y STEP Z:R1=0:X:R2=98-((
X/80)+9)*6:R3=32-((X/80)+52
):R4=36-((X/80)+17)
70 VDU23;1,R1;0;0;0;23;2,
R2;0;0;0;23;6,R3;0;0;0;23;7,
R4;0;0;0
80 NEXT:ENDPROC
```

And can you explain why this Mode 1 screen shrinking program works perfectly well on the BBC Micro, yet does nothing what so ever on the Electron. Why is this? - Richard Moore, Blyth, Northumberland.

● You just can't lock cassette files that easily. To explain here how to do it would enable a lot more people to write their own versions of your dubious file unlocker. Basically, just

The hare and the tortoise

THE BBC Micro and Acorn Electron computers both use the same 6502A micro-processor, but for some reason the BBC Micro is twice as fast as the Electron. Why is this? - Andrew Bury, Kingswinford, West Midlands.

● There are several reasons why the Electron is slower than its BBC Micro cousin. The first and most important, is that the BBC Micro uses many dedicated chips, like the 6845 CRTC video chip to refresh its screen ram. The Electron, on the

other hand, leaves this work to the overburdened 6502 and ULA.

This means that in the higher screen memory modes - especially 0-2 - more processing time is wasted on this task, which can drop the overall processing speed by nearly 25 per cent.

To make matters worse, the 6502 can only access ram four bits at a time. This effectively slows all ram access from 2MHz to 1MHz - a drop of 50 per cent - leaving the Electron chug-

ging away at roughly one third the speed of the BBC Micro in modes 0-2

However, there are several ways around this problem. The easiest is to buy the superb Turbo board from Slogger, which jacks the Electron up to within a few per cent of the BBC Micro's speed

Software techniques can help a great deal as well, for instance disabling interrupts from machine code when keyboard access is not required (see Philip Bender's letter opposite).

reverse the operation of your unlocker.

Your screen-squashing program relies on the presence of the BBC Micro's 6845 CRTC video chip. This is not present on the Electron, as the screen is driven by one Acorn custom ULA chip so the program won't work.

DFS exposed

I WISH to inquire if Mark Smiddy's very useful ADFS Exposed program in the November 1987 issue of Electron User could be adapted for use with ACP's E00 1770 DFS.

I have a number of discs now with all sorts of games and utilities requiring PAGE at &E00, and it would be very useful if I could check the disc status on those as well as my ADFS discs.

My configuration is an Electron and Slogger 64k/Turbo board, Plus 1 with ACP ASR (in which the E00 DFS is fitted), Plus 3, and PMS second processor. - John D. Mosby, Glenfield, Leicester.

● It is not possible to adapt the program easily as the DFS works in a completely different way to the ADFS.

However, I will tell you the total free space in figures, and if you need to see where the spaces lie then "INFO *" will help you.

As a DFS disc holds less information than an ADFS disc, and its layout is gen-

erally more comprehensible to the prying eye, a utility such as Mark's could be a slight case of overkill.

Garbled graphics

I RECENTLY bought an Epson P-40 printer and a First Byte printer interface. However, I don't seem able to understand how to get the printer to output in bit image mode.

I have experimented using VDU 1,27,75 which is ESC "K", but it seems to wait until the printer buffer is full before doing anything, and then it is printed all jumbled up.

Also, I have your Mini Office tape which I bought from your magazine and would like to say what a brilliant package it is

Thanks are also due to Slogger, whose advice enabled me to get my P-40 - which has no printer buffer - to work with the Plus 1. - Brian Westgate, Barnhill, Dundee.

● You are quite correct in choosing ESC "K", but you must give two parameters saying how much bit image data is being sent, low byte followed by high byte, followed by the data itself.

Furthermore, each byte in a VDU string must be preceded by a one, which means send the next VDU

code only to the printer. Try the following example, which should print 30 space invaders on your P-40:

```
10 MODE:VDU2
20 FOR S=1 TO 30
30 VDU1,27,1,75,1,8,1,0
40 RESTORE:FOR L=0 TO 7
50 READ B:VDU1,B
60 NEXT:VDU1,32
70 NEXT:VDU1,13,5:END
80 DATA 49,122,220,244,244,2
20,122,49
```

Snapshot taped

I AM having some problems trying to use the Snapshot utility in the September 1987 issue of Electron User. It works fine with View, but when I try to use it with games loaded via Slogger's T2P4 rom, the system switches over to tape and saves the screens to tape.

Can you tell me how to get it to work as it should? There are no typing errors in the program, as I am using the listing from the October tape. - James Hymes, Millwall, London.

● The T2P4 rom is designed to copy software from tape to disc. However, the cassette filing system will always be switched in while T2P4 is active. In addition to this, Snapshot is unlikely to work with commercial software: It will, however, work with your own and magazine listings.

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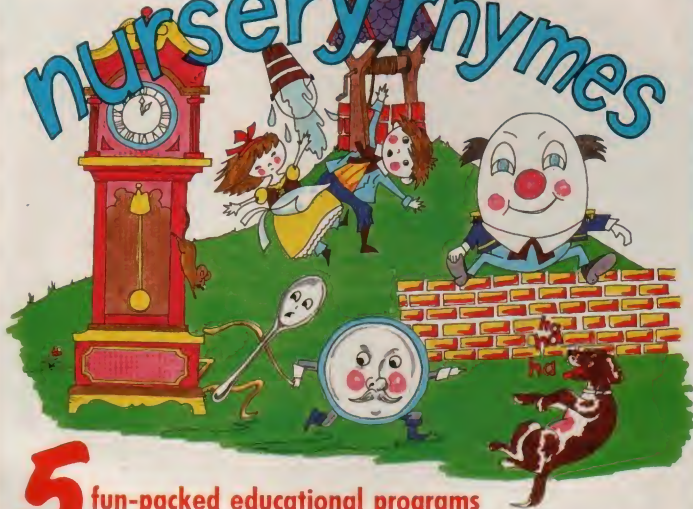


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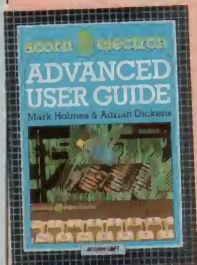
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This short utility provides you with a high-powered conversion program at your fingertips. It is easy to use and accurate. Type it in and save it, then run it - you should get a display like the one shown here.

When you run it you are presented with the different conversion units, metric on the left, Imperial on the right. Arrows indicate the current selection, and at the bottom is the current conversion factor. At the top of each column block is a window - these are the data input and output areas.

The spacebar alters the unit selection, the S key swaps columns and the < and > keys specify the direction of conversion.

For instance, to convert from grams to pounds first

Measuring up

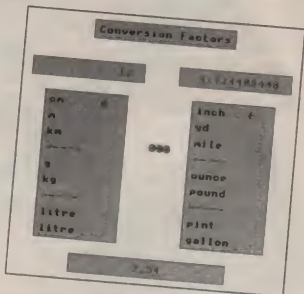
BARRY WOOD shows how to get converted

select the right-hand units with S and press the spacebar to move the pointer to pounds.

Press S to select the left-hand column and spacebar again to point to grams. Type in a number and press Return.

Now press > to indicate the direction of conversion and then the Copy key to find out the result. The value in pounds will be printed in the top window.

Note that some conversions are impossible - like litres to inches. These are indicated by an error message in the conversion factor box at the bottom of the screen.



```
10 REM In Action
20 REM Conversion Factors
30 REM by Barry Wood
40 REM (C) Electron User
50 ON ERROR MODE6:PROCerr
:END
60 MODE1:=Z=620205:PROCOF
:=FX,1
70 VOUDE17;G30TC;BF70;G
70FF;G1C38;
80 VOUDE117;G1C38;BF70;G
0EFF;G30TC;
90 PROCbx('Conversion Fac
tors,1)
100 F0RYX=ST025STEP20:PROC
bx(1,10,17)
110 PROCbx(2,6,14,1):NEX
T:D1M (10,9)
120 PROCbx(STRINGS(20, )
,30)
130 F0RYX=1 TO 9:READbs,bs
140 PRINTTAB(5,Y1+2+8)as*F
b(25,Y1+2+8)bs
150 NEXT:F0RYX=1T09:F0RYX=
1T09:READ as
160 IF as=4 (X1,Y1)=1:
ELSE (X1,Y1)=VALas
170 NEXT:NEXT:TC:=TRUE:QZ=0
180 LY1:=RY1+1:NL=NL+0
190 REPEAT COLOUR 2:COLOUR
129
200 VDU31,19,15,225+Q225+
Q225+01
210 PRINTTAB(4,6)FNF(NL):T
AB(24,6)FNF(NR);
220 F=(LY1,RY1):IF QZ=F+1
//
230 IF F=0 IS=FNs(>)Error
```

```
(<) ELSE IS=FNs(STRS*)
240 PRINTTAB(10,30)IS:PRO
CO(224):G3=GET:PROCO(32)
250 IZ=INSTR( "ghijklmno
pqrstuvwxyz",CHRSEX
):IF IZ<1 ELSE QZ=IZ-3
260 IF G1=83 IZ=NOTIZ
270 IF G1=83 IZ=NOTIZ
280 IF G1=83 IZ=NOTIZ
290 IF G1=83 IZ=NOTIZ
300 UNTIL FALSE:END
310 DEF PROCbx(X1,Y1,X2,Y
1,Y3,X4,CX
320 VDU31,32,Y1+2+8,CX:EN
DPROC
330 DEF FNIC(Y1)REPEATX=Y
1+1:IFYX=10RYX=1
340 UNTIL Y1=X4 AND Y1=7:
Y1
350 DEF PROCnum:LOCAL X1,Y
1,Y2,N
360 Y2=6:IF Y1=X4 ELSE X
1=Y2
370 REPEAT N=N+10:(GXAND15
)
380 PRINTTAB(X1,Y1)FNF(N);
390 REPEAT PROCbx:G1=GET:P
ROCOFF
400 UNTIL G1=13 OR G1=46 O
R (G1=82F AND G1=83A)
410 UNTIL G1=13 OR G1=46:I
F Y1=NL=N ELSE NR=N
420 IF G1=13 ENDPROC ELSE
Y1=10
```

```
430 REPEAT PROCbx:G1=GET:P
ROCOFF
440 UNTIL G1=13 OR (G1=82F
AND G1=83A)
450 IF G1=13 ENDPROC
460 REPEAT N=N+(G1AND15)/Y
1:Y1=Y1+10
470 PRINTTAB(X1,Y1)FNF(N);
480 REPEAT PROCbx:G1=GET:P
ROCOFF
490 UNTIL G1=13 OR (G1=82F
AND G1=83A)
500 UNTIL G1=13:IF Y1=NL=N
ELSE NR=N
510 ENDPROC
520 DEF FNF(N)=RIGHTS(STR:
NBS(12, )+STRN,"2")
530 DATA cm,inch,m,kg,pound,
litre,
540 DATA g,ounce,kg,pound,
gallon
550 DATA litre,pint,litre,
gallon
560 DATA 2.54,91.44,160934
.4,kg,pound,kg
570 DATA .0254,.9144,1609.
34,kg,pound,kg
580 DATA .0000254,.00001,1
.61,kg,pound,kg
590 DATA kg,pound,kg,pound,
pound
600 DATA kg,pound,kg,pound,
kg,pound
610 DATA kg,pound,kg,pound,
kg,pound
620 DATA kg,pound,kg,pound,
kg,pound
630 DATA kg,pound,kg,pound,
kg,pound
640 DATA kg,pound,kg,pound,
kg,pound
```

```
7,4.55
650 DEF FNF(t$):LOCAL LX
660 IS=STRINGS(8, )+IS+5
TRINGS(10, )
670 LX=LEN:SOIV2:=MID$(t$,
LX-10,20)
680 DEF PROCbx(X1,Y1,X2,Y
1,X3,X4
690 LX=LEN+8:X1=20-LX:Y1
700 PROCbx(X1,Y1,X3,X4):COLO
UR 129
710 PRINTTAB(X1,Y1)IS:END
PROC
720 DEF PROCbx(X1,Y1,LX,DX):
LOCAL Y1,Y2
730 Y1=X1+LX+1:Y2=X1+LX+2-Y
1-DX+32
740 X1=X1+32:Y1=(Y2-Y1)+32
750 PROCbx(2,X1,Y1,X3,X4,Y1,
)
760 PROCbx(1,X1,Y1,X3,X4,Y1,
):ENDPROC
770 DEF PROCbx(CX,QZ,X1,X2,X
1,DX)
780 VDU24,QZ=01:QZ=01:ST=0
X1+QZ;
790 GCOLB,128+CX:CLG:ENDPR
OC
800 DEF PROCbx:LOCALBT:BT=1
810 DEF PROCbx:LOCALBT:BT=
0
820 VDU23,1,B1=0;0;0;0:EN
DPROC
830 DEF PROCbx:W1=10:PROCO
N:REPORT
840 PRINT at line :ERL:IE
NDPROC
```

IN this short series of articles we are examining the popular programming language Pascal, invented around 1970 by Niklaus Wirth.

There are two different packages available on the Electron - ISO-Pascal, a rom-based version supplied on a cartridge ready to be plugged into a Plus 1 or Rombox, and S-Pascal, a cassette-based version.

The rom cartridge is the full implementation of the language (to the ISO standard), while S-Pascal is a much simpler, cut down (and cut-price) version. All the programs this month were written using S-Pascal, but they will also run under ISO-Pascal.

Last month Mike Plummer introduced the language, revealing a little of its history and basic structure. Essentially it was designed to teach good programming practice to students studying computer science and it is a highly structured language as we'll see.

It is a popular language, and although rarely seen on home micros, is in widespread use by professional programmers on much larger and powerful computers than our Electron.

This article is devoted to just one program - a short routine that will convert a temperature in degrees Fahrenheit to one in degrees Celsius. This shows quite clearly the beautiful structure of Pascal programs.

We'll write it in several different ways to show the wide range of commands available and their syntax. Program I shows it in its simplest form.

Notice that it starts with:

```
program temp(input,output);
```

This is the hallmark of all Pascal programs. It contains the program name, *temp*, and tells Pascal that information will be input and output - we are going to type a temperature in, convert it and print out the result. Most Pascal programs input and output information - if they sat there doing nothing they

would be very dull indeed!

The next line is a list of the variables used in the program and their type. We are going to use *f* to hold the Fahrenheit temperature and *c* to store the Celsius temperature. They are both integers.

```
program temp(input,output);
var f, c : integer;

begin
  write('Enter temp: ');
  readln(f);
  c:=5*(f-32) div 9;
  writeln('Celsius=',c)
end.
```

Program I

Logically, the labels *begin* and *end.* mark where the program begins and ends. The first thing it does is write "Enter temp:" on the

screen. It then reads a number from the keyboard into the variable *f* using *readln(f)*. We could have used *read(f)* here, but *readln(f)* is better as it moves to a new line after the input.

The conversion from Fahrenheit to Celsius is carried out by:

```
c:=5*(f-32) div 9;
```

Notice that we use *:=* to set a variable equal to a value, whereas in Basic we would use just an equals sign on its own. Also note that all statements except the last end with a semicolon. This is the statement separator and acts rather like Basic's colon.

Finally the new temperature is written to the

screen and the program stops when it hits the *end.* on the last line.

Now we'll alter the program slightly, taking out the calculation from the main loop and placing it in a procedure called *ftoc*. This is called from within the main *begin - end.* structure:

```
program teeo(input,output),
var f, c : integer;

procedure ftoc;
begin
  c:=5*(f-32) div 9;
  ftoc;
end;

begin
  write('Enter temp: ');
  readln(f);
  ftoc;
  writeln('Celsius=',c)
end.
```

Program II

As you can see the procedure has been placed after the variables, but before the main *begin - end.* program loop. Procedures always come before the start of the program, unlike Basic which insists on them being placed at the end.

Pascal will skip all procedure definitions at the beginning of a program and will always start execution at the main *begin.*

Notice that the procedure

Turn to Page 56 ▶

... Pascal is in widespread use by professionals on much larger computers than our Electron ;

Programming

4 From Page 55

has its own *begin - end*; loop indicating where it starts and ends. It could also have its own variable list as well. It is called quite simply from the main loop by entering its name - *ftoc*.

Like Basic, we can pass parameters into procedures. Program II can be modified

```
program temp(input,output);
var f, c : integer;

procedure ftoc(d:integer);
begin
  c:=5*(d-32) div 9
end;

begin
  write('Enter temp: ');
  readln(f);
  ftoc(f);
  writeln('Celsius=',c)
end.
```

Program III

to produce Program III.

Here we are passing the Fahrenheit temperature in *f* to the procedure *ftoc*. Inside the procedure the local variable *d* is used.

Notice that in the procedure definition we must specify the type of the parameter passed. Pascal is very strict about variable types and ranges.

We have been using our procedure *ftoc* to calculate and return a single value, so why not use a function instead? Program IV shows how this may be done.

As a function returns a value, Pascal insists that we specify its type in the definition. In this case it is an integer. The value is returned by equating its name to the result of the calculation in the main body of the definition.

Apart from these two points, the program is no different from the last one.

```
program temp(input,output);
var f, c : integer;

function ftoc(d:integer):integer;
begin
  ftoc:=5*(d-32) div 9
end;

begin
  write('Enter temp: ');
  readln(f);
  c:=ftoc(f);
  writeln('Celsius=',c)
end.
```

Program IV

```
program temp(input,output);
var f : integer;

function ftoc(d:integer):integer;
begin
  ftoc:=5*(d-32) div 9
end;

begin
  write('Enter temp: ');
  readln(f);
  writeln('Celsius=',ftoc(f))
end.
```

Program V

However, it allows us to use the function call wherever we could use a number or variable. This enables us to shorten the last program.

The variable *c* in the last *writeln* has been replaced by the function call *ftoc*.

As these short programs show, Pascal is a highly structured programming

language, forcing you to lay out your listings in a clear and easy-to-read manner. It encourages good programming practices.

● We'll continue to look at this fascinating language next month when Mike Plummer will be back with some more complex examples.

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TO ORDER TURN TO THE FORM ON PAGE 53

Feature

From Page 57

the *SPOOL file with:

```
*WORD
SETUP 1
READ STRIP
```

This is how the program will look in edit mode:

```
>LIST
10REM Strip
20MODE 8
30PRINT
40INPUT "Filename:";A$
50A$=OPENIN A$
60B$=OPENOUT "Listing"
70REPEAT
80C$=BGET#A$
90PUT C$+13, C$
90IF C$+13 IS NOT EOF#A$
FOR I=1 TO 5:C$=BGET#A$;NEXT I
11BUNTL$=EOF#A$
12CLOS#A$
13PRINT "Finished"
>*SPOOL
```

You'll see it starts with the prompt > then LIST, and is followed by the program, complete with line numbers. Finally, >*SPOOL follows at the end. To get back to the

original listing in View we need to tidy this listing up a little.

The >LIST and >*SPOOL are easily deleted with Func+8 (delete line), but the line numbers are impossible to remove. You can't search for and replace them.

This is where the program Strip we have been experimenting with comes in. It's job is to strip the line numbers from a SPOOLED Basic program.

You've got it on disc, so *EXEC TEST to load it into Basic. Now run it.

You'll first be prompted for a filename, so enter STRIP the file you just spooled. The disc drive will start up and after a short while the message "Finished" will be printed on the screen.

Strip will still be there on the disc, but in addition there will also be a file called Listing - this is Strip with the line numbers removed.

```
*BASIC
AUTO
REM Machine Code
oswrch=&FFEE
FOR pass=0 TO 2 STEP 2
P$=&C00
[ OPT pass
LDX #32
loop
NEXT
```

Go into View as before and read it in. Chop off the >LIST and OL at the start and finish and you are left with your original program in View.

So far we've seen how to write Basic programs in View. Well, it is just as easy to write machine code files as well. Enter the following short assembly language listing above into View:

Save it with the name MCODE then *EXEC it into Basic. Press Escape when it has finished loading and run it. Now execute the machine code with CALL &C00 and

you should hear a beep if all is well.

Although I have only discussed Basic and assembly language here, the technique applies equally well to other languages - particularly to Lisp which hasn't got any form of editor. It is far easier to write in View and *EXEC the file into Lisp.

As we've seen, View is more than just a simple word processor - it is a powerful program editor and development tool as well.

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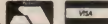
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is a slow task, and is often aided by the use of games, puzzles and other easily followed teaching tools. But in order to avoid loss of interest, all such devices must have the added attraction of being fun.

The use of computers in

homes and primary schools is enabling some of these educational tools to be converted into colourful, interesting programs which can be used in the home or classroom unsupervised – to an extent – by the parent or teacher.

The Electron has long been established in primary schools throughout the country, and was therefore an ideal vehicle for **Odd One Out**. Two players are required for this game, which will help stimulate discussion over the questions posed. There are only 30 questions, but the program only just squeezes into the Electron's memory as it is, and the use of colour – which helps to retain interest – and 40 column text would be lost if a higher-memory mode had been chosen at the outset.

Each player is first asked for their name – always important in children's games. Large letters are used here, and extensively throughout the game to aid with reading the messages.

The players can then sit

back and wait while the playing board is drawn on the screen. This consists of two winnometers, which are wide horizontal bars, one above the other.

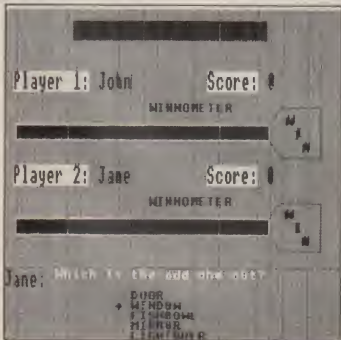
These gradually fill with yellow each time a player's question is answered correctly, and the player who reaches his win marker first is awarded one point, and both winnometers are then reset for the start of the next game.

Each question takes the form "Freddy, which is the odd one out?" followed by a list of five objects. A pointer slowly moves down the list, and selection is made by pressing the spacebar while the pointer is over one of the choices. This is so children with limited coordination can participate in the game.

The 30 questions are held in data statements at the end of the program, and if you want to change them, the format is straightforward.

Four words or phrases which have something in common are separated by commas, with a fifth word or phrase which is the odd one out inserted anywhere among them.

Then another comma and a sentence explaining what the other four have in common, and finally another comma and a number between 0 and 4 identifying which of the five items is the correct choice.



PROCEDURES

setup Set up arrays
title Display title page
drbd Draw playing board
ask Ask a question
qu Fetch a question
yes Player got it right
no Player got it wrong
sc Update winnometer
big Print double-height text

VARIABLES

P1% Player one's score
P2% Player two's score
sc1% Games won by player one
sc2% Games won by player two
qu\$(30,5) Array of questions
ans\$(30) Array of answers
maxq% Number of questions
Q% Current question

Turn to Page 60 ▶

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